THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2420.] LONDON, SEPTEMBER 28, 1909. [61ST YEAR. PRICE 6d.

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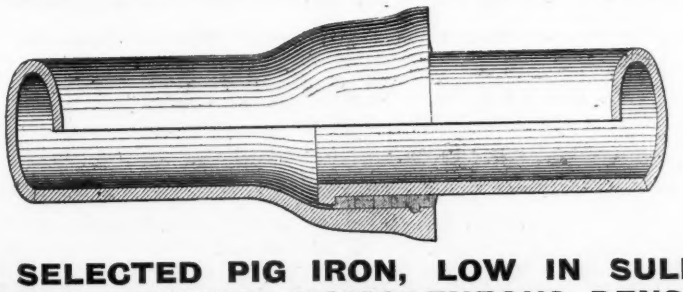

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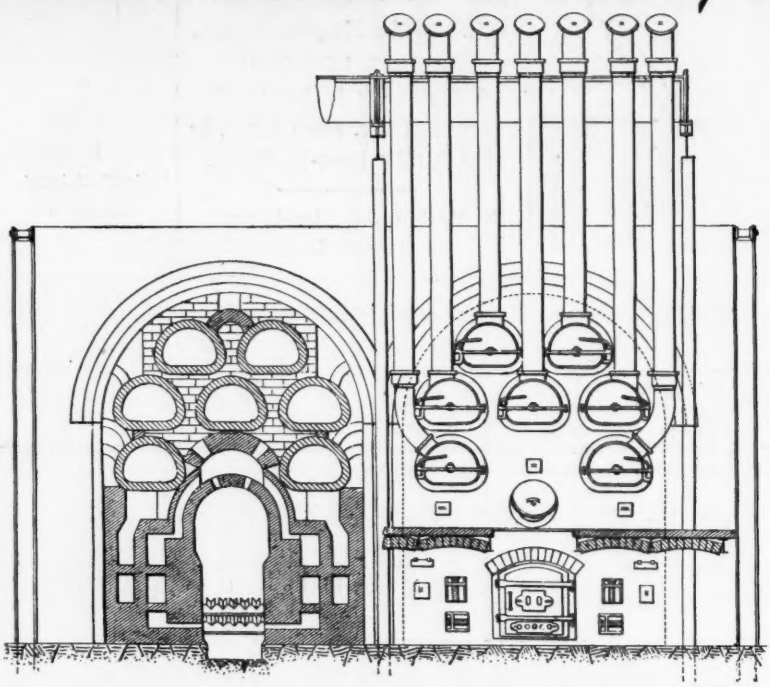

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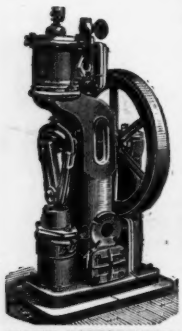

Fig. 705. "SINGLE RAM" STEAM-PUMP.

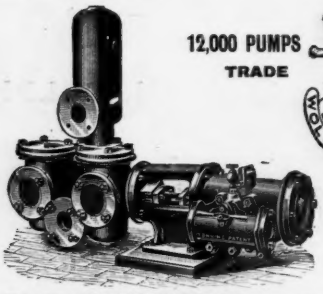

Fig. 808. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

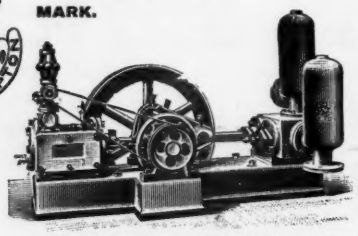

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

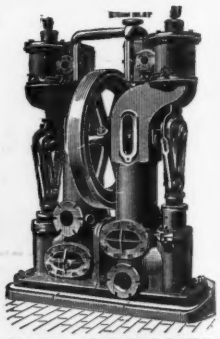

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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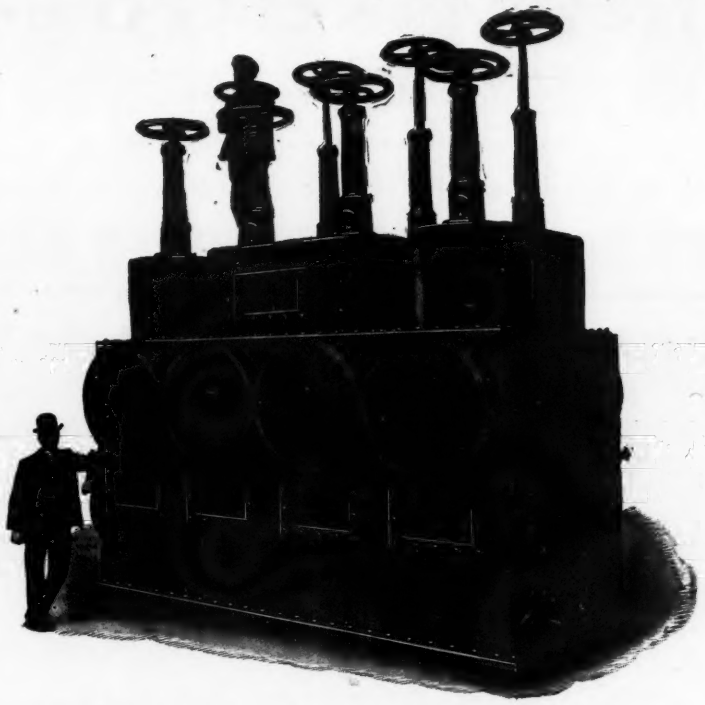

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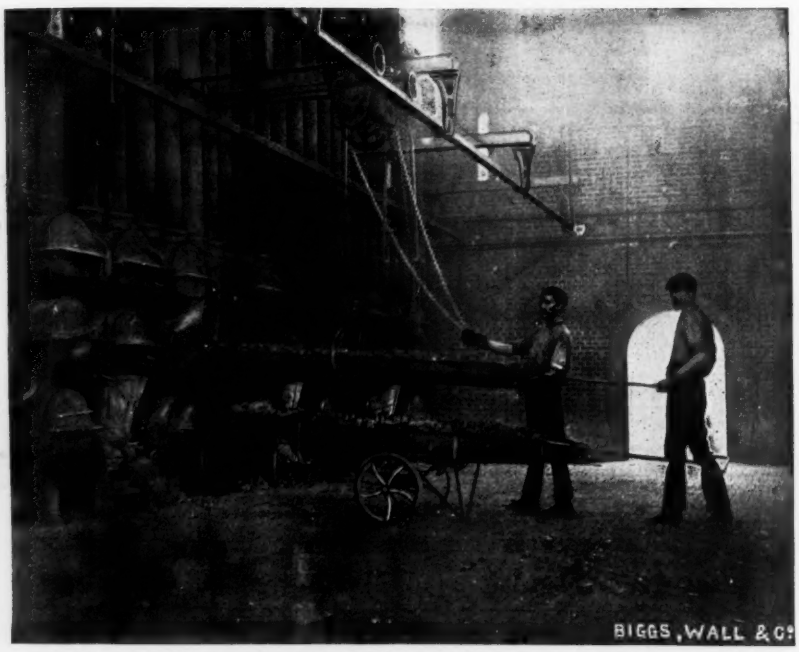

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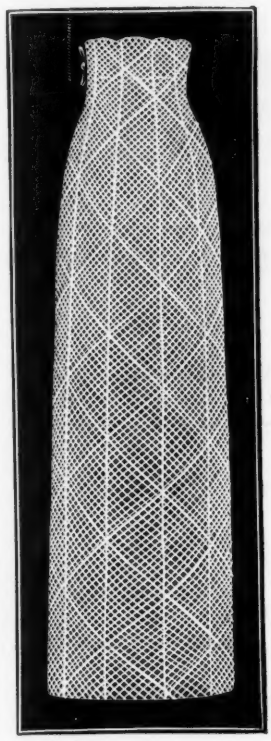

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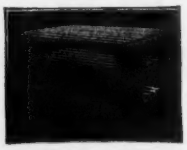

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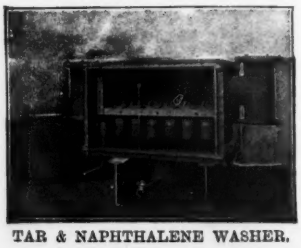

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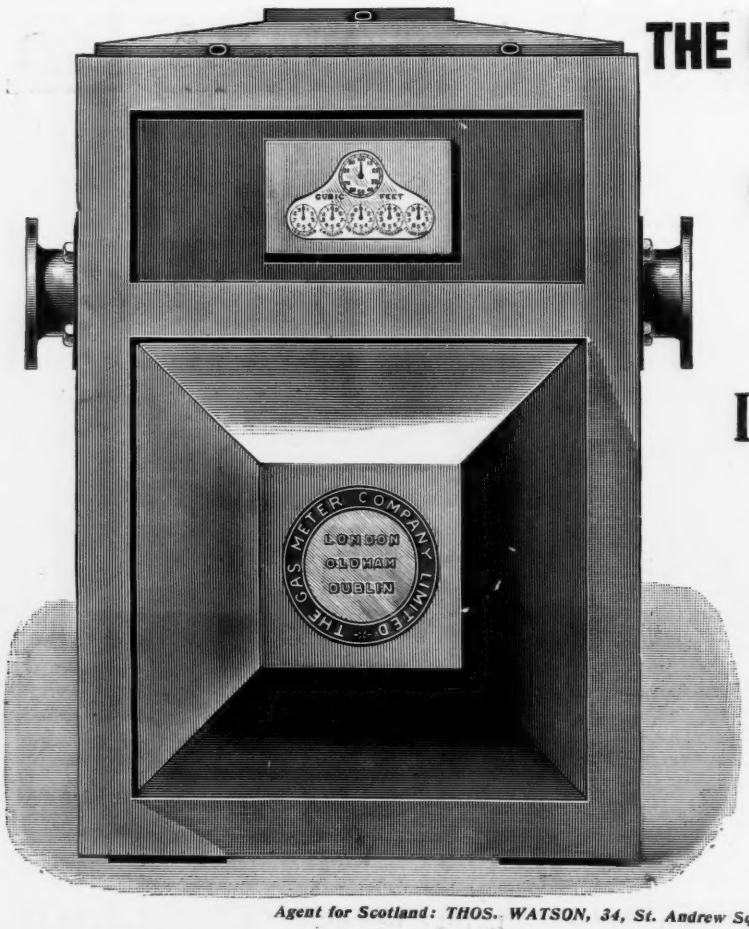

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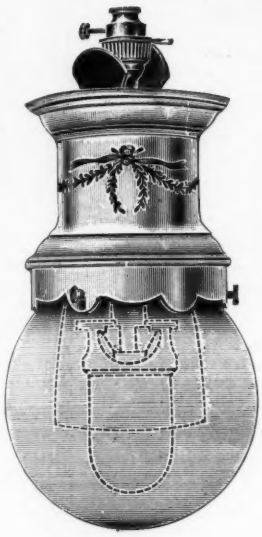

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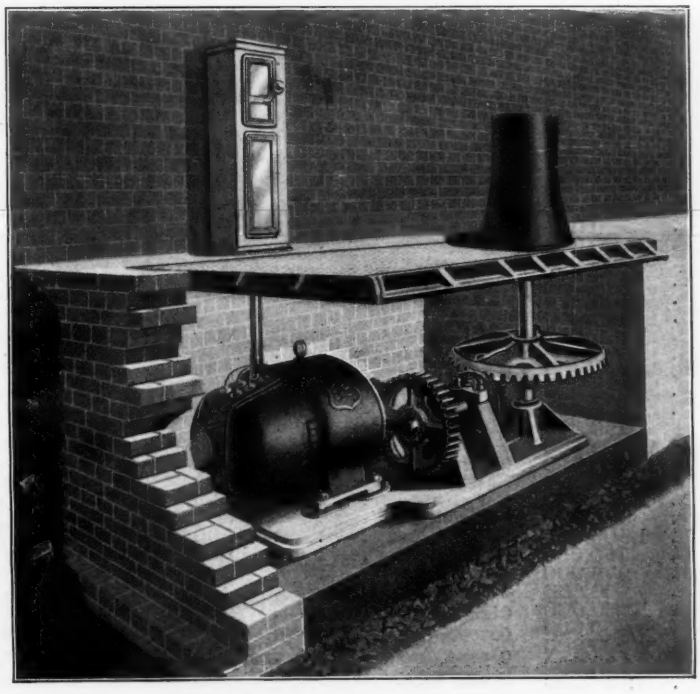

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Bruges, Belgium	200,000	Lea Bridge (2nd)	350,000	Stettin, Germany	880,000
Brussels—Anderlecht	350,000	Lea Bridge (3rd)	400,000	Stockholm	1,500,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
Brussels—Forest	1,000,000	Leeuwarden, Holland	400,000	Stockport	600,000
Brussels—Koekelberg	1,000,000	Leiden, Holland	500,000	Stockport (2nd)	600,000
Brussels—St. Gilles	1,000,000	Leiden (2nd)	575,000	Stockport (3rd)	400,000
Brussels—St. Josse	1,000,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—St. Josse (2nd)	600,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville	750,000	Lemberg (2nd)	500,000	Swansea (2nd)	1,000,000
Brussels—Ville (2nd)	750,000	Liége, Belgium	1,000,000	Swansea (3rd)	450,000
Brussels—Ville (3rd)	1,500,000	Liége (2nd)	750,000	Swindon	300,000
Brussels—Ville (4th)	350,000	Lincoln	500,000	Sydney—Harbour	500,000
Bucarest, Roumania	1,100,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest, Hungary	50,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Budapest (2nd)	1,750,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlisle	600,000	Louvain, Belgium	800,000	Syracuse, N.Y.	850,000
Carlsruhe, Germany	500,000	Lübeck, Germany	400,000	Taunton	225,000
Chigwell	350,000	Maastricht, Holland	200,000	Taunton (2nd)	350,000
Chorley	300,000	Magdeburg, Germany	1,400,000	The Hague Holland	1,000,000
Commercial, London	850,000	Maidenhead	225,000	The Hague (2nd)	500,000
Commercial (2nd)	850,000	Maidenhead (2nd)	225,000	Tilburg, Holland	400,000
Commercial (3rd)	1,250,000	Maidstone	500,000	Torquay	350,000
Commercial (4th)	2,000,000	Malines, Belgium	500,000	Tottenham	750,000
Copenhagen	700,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
Copenhagen (2nd)	2,500,000	Malta	400,000	Tottenham (3rd)	350,000
Courtrai, Belgium	250,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
Coventry	600,000	Manchester (2nd)	3,500,000	Tottenham (5th)	1,000,000
Coventry (2nd)	600,000	Marlborough	100,000	Tottenham (6th)	1,250,000
Cracow, Galicia	200,000	Mayence, Germany	700,000	Tunbridge Wells	1,000,000
Cracow (2nd)	200,000	McKeesport, Pa.	500,000	Utrecht, Holland	1,000,000
Crefeld, Germany	500,000	Merthyr Tydfil	300,000	Utrecht (2nd)	1,000,000
Croydon	1,250,000	Middlesbrough	1,250,000	Verviers, Belgium	1,000,000
Croydon (2nd)	625,000	Namur, Belgium	175,000	Vienna	3,500,000
Croydon (3rd)	625,000	Nelson	400,000	Vienna (2nd)	2,500,000
Croydon (4th)	550,000	Newburgh, N.Y.	600,000	Waltham	400,000
Debreczin, Hungary	100,000	New York	5,200,000	Wandsworth & Putney	1,800,000
Deventer, Holland	150,000	Nictheroy, Brazil	250,000	Watford	300,000
Deventer (2nd)	200,000	North Middlesex	150,000	Watford (2nd)	350,000
Dorking	150,000	North Middlesex (2nd)	200,000	Wellington, N.Z.	350,000
Dublin	2,000,000	North Middlesex (3rd)	75,000	West Bromwich	550,000
Dublin (2nd)	2,000,000	Norwich	1,000,000	West Ham	1,500,000
Dublin (3rd)	650,000	Norwich (2nd)	300,000	West Ham (2nd)	800,000
Dundee	1,500,000	Norwich (3rd)	500,000	Weston-super-Mare	350,000
Dunedin, N.Z.	150,000	Nottingham	1,000,000	Weston (2nd)	350,000
Dunedin, N.Z. (2nd)	275,000	Nuneaton	125,000	Wexford, Ireland	100,000
Durham	200,000	Oberhausen, Germany	175,000	Wiesbaden, Germany	850,000
Düsseldorf, Germany	1,000,000	Oldenburg, Germany	200,000	Winchester	225,000
Eastbourne	1,250,000	Ostend, Belgium	100,000	Winchester (2nd)	125,000
Edinburgh	2,000,000	Ostend (2nd)	200,000	Wolverhampton	1,500,000
Epsom	225,000	Perth, W.A.	125,000	Zwolle, Holland	200,000
Epsom (2nd)	300,000	Poole	1,500,000	Zwolle (2nd)	200,000
Falmouth	150,000				

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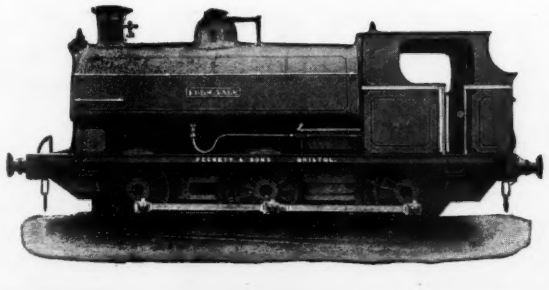

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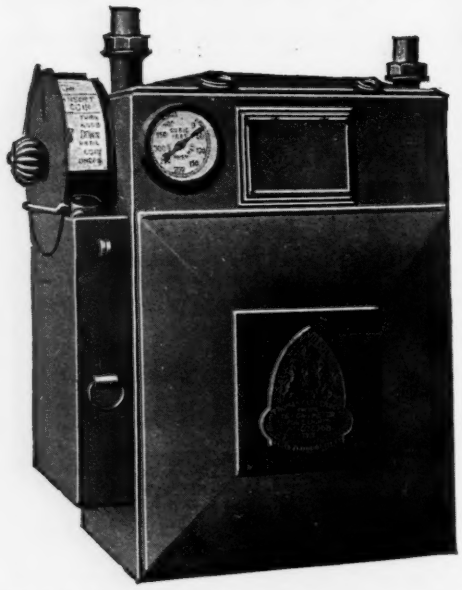

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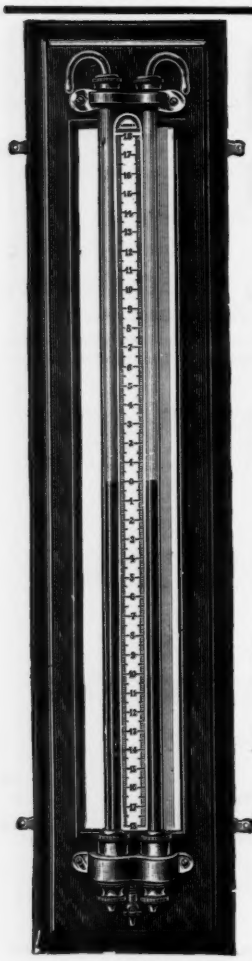

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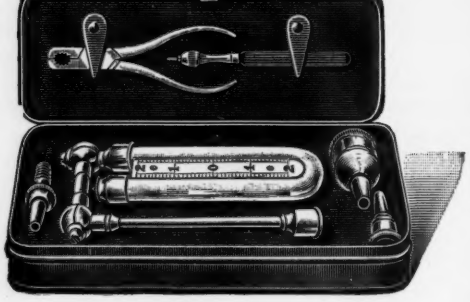

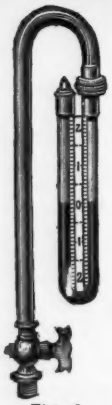

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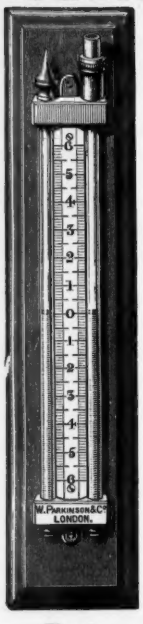

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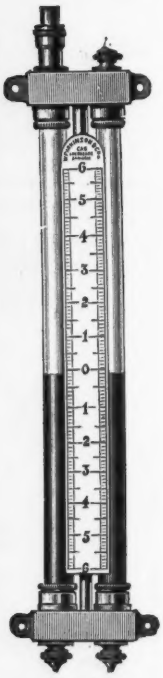

Fig. 3B.

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VOL. CVII., No. 2420.—TUESDAY, SEPTEMBER 28, 1909.

EDITORIAL NOTES—GAS, &c.

Signs of the Times.

NOTHING could have been more thoroughly cordial than the reception that the members of the Eastern Counties Gas Managers' Association met with in Hull last week. The British Gaslight Company (whose Engineer and Manager in Hull, Mr. John Young, is the President of the Association for the year), the East Hull Gas Company (whose Engineer, Mr. John Holliday, supplied an instructive paper at the meeting), and the civic dignitaries and officials all combined to make the visitors feel that their presence in the city was heartily welcome, and that it was recognized that the objects of their conference and works' inspection possessed those characteristics that are, through technical and industrial endeavour, of eminent advantage to mankind generally. Though tempted to dwell on the kindness received on all sides at Hull, and on the excellent and helpful relationships existing between private gas enterprise in the city and the municipal authority (about which relationships his Worship the Mayor gave voice to some sentient observations at the opening luncheon), there are two or three other points to which attention must be given. The Presidential Address of Mr. Young at the meeting is dealt with in a succeeding article; and there is nothing that can be usefully said about the contribution Mr. Holliday made to the meeting, on "Gas-holder Reconstruction," beyond a word of congratulation to him upon the thought and skill that find expression in the work that formed the basis of the paper, and which work was environed by difficulty of no mean degree.

The greater part of the business meeting was taken up by a discussion on Mr. W. J. Carpenter's paper, read last April, on "Gas Practices at Yarmouth," which opened up, in novel and attractive form, some fertile ground on those evergreen subjects that deal with the economics of gas administration on the trading side. There are certain salient points and lessons in the paper which the members did not fail to fasten upon in the discussion. They treat of the present position and the future needs of the gas industry. In his Presidential Address at the meeting of the Institution last June, and again last Thursday, Mr. Thomas Glover paid Mr. Carpenter the compliment of drawing special attention to the remarkable figures presented in the paper, supplied by a dissection of the day and night consumption at Yarmouth, and which brought out the extraordinary and gratifying knowledge that an equipoise has been established between the day and night consumption. Other gas engineers have since made similar observations; and the experience of Yarmouth has been found reflected in several other places—Norwich and Felixstowe for example. Little consideration is required to endorse Mr. Glover's view that this comparison between the day and night business is going to be of great value to the gas industry. We have only to consider the directions whence this great day consumption has accrued, and how unassailable in the matter of efficiency are these applications of gas, to see the value of the statistics in enforcing the stability of the gas industry from the point of view of capital investment. While the day business is accumulating in this way, there is the night business to protect; and it must not be forgotten that the stronger the competition, and the more facilities that are offered by the competitors of gas, the more independent will some consumers become. That perfectly human quality has to be combated; and the competitor must be checkmated in his efforts to steal marches. What, it may be asked, are we drifting to in this regard?

Free inspection and maintenance, with a charge only for the material used, is with us; and there was full recognition in Thursday's discussion that this was the administrative mode that would in future have to be adopted by all gas undertakings for the proper protection of their lighting interests. We have efficiency and economy on one side; consumers' indolence and competition on the other. What has to be done is not to allow the two latter to injure the two former; and the only answer that has yet been found to the question "How best "is this to be done?" has been free inspection, cleaning, and adjusting. This work is going to cost money. Protection is worth paying for. But a steady eye and firm hand must be kept upon the facilities afforded, in order that there may not be wasteful and unprofitable expenditure. This brings us to another point of the discussion. If there is going to be a growth of the system of free inspection and, up to a point, maintenance, then more properly trained men will be required in this field; and every gas undertaking must take steps to provide their own men. That is the requirement. It is no use sending men out among the consumers who are only half qualified for the work they have to perform, and are otherwise unfitted to act as representatives between gas supplier and customer. Some complaint was made at the meeting that our local technical colleges do not provide opportunities for the training of gas-fitters. There are few local technical schools that have been encouraged to do so, and few that have been approached in the matter. If there is any blame attaching in this connection, let us be just, and see whether it should not be apportioned so that a substantial share remained with the gas undertakings. However that may be, better provision for thorough training has got to be made; and those responsible for the administration of gas undertakings who have not already moved in the matter will have to bestir themselves, in order that injury may not be self-inflicted by apathy over a fresh necessity born of changed condition.

Views from Hull.

THE broad and intuitive mind of Mr. John Young was before the members of the Eastern Counties' Association in every part of the address which he delivered to them last Thursday. Throughout, it was commercial-technical. In such a business as that of the gas industry, it is impossible to separate the one side from the other. In fact, the commerce of the industry largely governs its technic. Now, it is not what we can produce under a given set of technical conditions and practices, but what we must produce to meet the diverse requirements of the times. This is true to-day more than it would have been (say) thirty years ago. The staple product, for example, must be multipotent. It must be a product that will best suit the incandescent burner for lighting, the cooking and the heating stove, the manufacturers' furnaces and crucibles, and last, but not least, the work that is required of it in gas-engine cylinders. The secondary product, coke, must be of a kind that will meet, within practicable limits, both the industrial and domestic uses. So we go on, finding in every form of product how the commercial affairs of the industry must dominate technical procedure if the financial record is to be endorsed by the coveted term "success." In the consideration of some of the commercial-technical phases of our industry, we may traverse with Mr. Young from coal to certain of the uses of gas, and to commercial method.

The President is on safe ground in seeing no good in the Coal Mines (Eight Hours) Act. Never has there been a legislative measure that has belied more quickly the imaginative utterance and specious argument of its backers. It has come as a stormy petrel. It has caused much disturbance in the coal-field, and has cast many a shadow beyond. It has thrown the whole of the industries depending upon coal for their operation into a state of suspense, and has put them to considerable expense in providing for the threatened dislocation of supplies. From a fair state of certainty, the Act has precipitated industry into one of uncertainty, and has provided the coal industry itself with fresh and perpetual causes for disturbance. We cannot follow the President in his statements as to the date for the introduction of the Bill having been well chosen by the Miners' Unions, and as to their hoping to get the Act into operation on a falling market, so that they could point out—not "very justly"—that the price of coal under the new Act was less than the previous

year, and "no doubt claim that it had been beneficial to the "community at large." The Eight Hours' Bill now in force as an Act had an antecedent history; and a measure of the kind would have come into operation long before if the Coal Miners' Federation could but have had their way. No question of high prices and a falling market had any weight in the introduction of the present measure. It was merely politically opportune; and there were certain pledges to be fulfilled which, unfortunately, were more respected than the interests of industry and the community generally. The price of coal is lower than it was a couple of years ago; but the miners have, and honestly, made no claim that the Act has had anything to do with bringing about the more moderate terms. We all recognize that the price of coal would be lower still were it not for the Act. As a matter of fact, the basis of the miners' wages is the price of coal; and one of the effects of the Act is going to be a higher minimum level for the miners' wages, which will, in the natural order of things, keep the price of coal above the old normal under the prevailing conditions. Another effect is the reduction of the output. "We hear of reductions of 10 and 16 per cent. "per man," says the President. "This must mean a per- "manent enhancement of the price of coal; and the cost of "production of every article manufactured in this country "must therefore be increased." Beyond this is the additional cost of working the collieries that the operation of the Act must bring about. Whatever the means (though they be artificial), the enhancement of the price of coal will benefit the wages of the miners. We must not lose sight of facts, nor of the fairly discernible motives for the Act. In its origin, the Act is purely Socialistic. The Government have undertaken to carry through a programme of social reform. They are walking in unexplored ways; and in this instance, they have produced a monstrosity clothed in "social reform" garb. The "reform" has already proved injurious to the people and to industry. It is by the protection and assistance, and not by the assailing of industrial economy, that the country can maintain its position, that more opportunity for work can be given, and that the level of social status can be raised and maintained. The Eight Hours' Act has already proved itself a melancholy mistake.

Treating of the residual products of gas manufacture from the commercial point of view, the President on the whole is cheerful. He regards the outlook for coke as "hopeful;" and for sulphate of ammonia as "distinctly hopeful." But his high plane of optimism in these respects does not survive his survey of the tar market. Competition has arisen, and it is increasing, from other sources. In short, the increasing production must be looked upon with "grave fears," unless new markets can be created. But, other than for road use, there is not in sight any great activity in trying to evolve new uses for tar. From our way of thinking, there is little use in deploring the application of a material of such intrinsic richness to such a common purpose as road surfacing, if there is not a better use at hand, with the daily copious production of the commodity, not only from gas-works but from coke-oven plants. These plants, by the way, do not appeal to the President as being of any service to the gas manufacturer, having regard to the character of the gas, and the purposes to which town's gas is applied. Illuminating power in this country imposes a limitation to the actions of the gas manufacturer on his technical side; and this is a point in Mr. Young's review of the carbonization position, in relation to which he adopts a non-committal attitude, and shows no preference for any particular system, though he regards the steady passage of coal through the vertical retort (giving, as it does, greater uniformity of product throughout the period of carbonization) as being theoretically correct. This lifts the veil on a preference as between intermittent and continuous carbonization in vertical retorts; but it goes no farther. For it is clear that Mr. Young has a leaning of tenderness towards horizontal and inclined retorts under the newer method of working, which method indicates that the prevailing practices of the immediate past possessed the weakness and wastefulness, ofttimes revealed, of a too slavish following of tradition.

By kinship, there is a tie between the President and America; and he has some instructive data to put forward as to the experiences there of big charges and high temperatures. This is interesting not only on account of the results, but because America, through the early and the widespread adoption of carburetted water-gas plant, at one time fell behind in coal carbonization practice. In the more recent years, however, there has again been a forging ahead; and there are to be found in American works now some of the best examples of horizontal and inclined retort working. And we are not sure, having heard Mr. Young's remarks, that America has not preceded us in securing the advantages of heavier charges in horizontal and inclined retorts. However that may be, the cited results are excellent; but we have no information as to the character of the coal used. It must be a generous coal; and it is safe to say, having regard to the illuminating power of the gas, and the burner used in its testing, though the make is high the gas is good, and low in inert constituents. In connection with the heavy charging of horizontal retorts, there is a point in the address on which it would be interesting to have more details. The President states that "the scoop containing the charge acts as a "discharging ram, and is so constructed that it leaves an "almost full charge in the retort. The space left unfilled "is only about 3 inches from the top of the retort." This shows that there are ways and means of utilizing the scoop for almost filling a retort; and it contests the contention that the projector is the only practicable way of putting in a practically full charge. It can only be conjectured that the scoop is an unusually broad and shallow one, to pass over an empty space of merely 3 inches at the top without disturbing the lie of the charge; and that, as the head of the scoop must necessarily be a large one to negotiate a big charge, it must be a hinged one, upturning on the return stroke (after the manner of the Fiddes-Aldridge machine), to pass over the top of the charge. Perhaps Mr. Young can say something more about the construction of this scoop.

There are words of wisdom for the budding gas engineer in the address, as to training and the value of system in work, both technical and commercial. The chief executive official of a gas undertaking must be not only an engineer, but a good manager both technically and commercially; and, in this connection, the words of the President are pregnant with meaning when he says that "in the training "of the young gas engineer, his commercial instincts are "usually left to develop by chance." This ought not to be. The fortunes of an undertaking lie in large measure in the ability shown in buying and selling, and in the spirit, intelligence, and diplomacy infused into the competitive work of the day. The spirit need not be obtrusively militant; but it must be of a kind that is both seen and felt. Such spirit is found at Hull; and one effect is modestiy referred to by the President. In the commercial department of the Hull station of the British Gaslight Company, a special feature has been made of the lighting of tradesmen's premises, both internal and external, with the result that there are "in use "on the maintenance plan 1254 lamps, representing 5016 "burners, nearly the whole of which have *superseded* elec- "tricity." Well done! Another line of the gas business which is the subject of much technical and commercial consideration at the present time is that of gas heating; and upon this the President passed some instructive comment. But in this regard our impression is not that of Mr. Young, that the Gas Heating Research Committee of the Institution have accepted the theory that rooms can be heated by radiated heat alone. We think there has been a little misconception on his part in reference to this point. However, from beginning to end, the address is a thoughtful one; and there was profit in its hearing, as there will be in its reading.

Purification by Liquids.

THE greatest novelty in the whole proceedings at the meeting of the Eastern Counties Association at Hull last week was the Feld plant that has been erected at the East Hull Gas Company's works for the purification of the gas from sulphuretted hydrogen by washing in liquor in Feld's centrifugal washers. In fact, it is not too much to say that it is the greatest novelty at the moment in the whole range of plant employed in British gas-works; but it has yet to prove its title, under British gas-manufacturing conditions, to superiority over the present system of effecting the same purpose. That superiority has to be proved from the twin points of efficiency and economy. Oxide purification has an established reputation for efficiency as an eliminator of sulphuretted hydrogen from gas; the nuisance associated with it is not great; the purifiers require opening less frequently than was formerly the case; but at the best the process and all it entails can only be regarded as a cumbrous method of achieving the ends of purification and the recovery of the sulphur. A large space is required for the purifying-boxes; the material has in most cases to be transported from a distance to the gas

works; the system involves, over all, considerable labour in handling the material, and in the work of revivification; and again there is the transporting of the spent oxide to the place of sulphur recovery, and then the expense of the recovery. But, after all, deducting the cost of the new material from the revenue obtained for the sulphur-laden oxide, the net purification costs per 1000 cubic feet are exceedingly modest. However, there has for the past quarter of a century been fascination in the idea of conducting the purification of gas in closed vessels by means of liquids; but from the Belfast experiences to the present time, the theoretically ideal has not eventuated in the perfection of operation and result that appeals to the practical mind. Has Herr Feld succeeded where others have failed? Has he succeeded in producing a plant, self-contained, in which a cyclical action proceeds without waste and with economy, without the escape of anything but innocuous gases, in which plant the unpurified gas enters, the sulphuretted hydrogen is totally eliminated, and the sulphur is removed as a solid precipitate? If so, then Herr Feld will deserve the highest esteem of the gas industry. For such a system will mean further economy and greater facility, and give to the industry the direct marketing of a readily selling product.

From the works of the East Hull Gas Company is to come the proof, or otherwise, of success; and upon Mr. John Holliday, the Engineer of those works, rests the responsibility of telling us whether or not the system really inaugurates an acceptable change in our methods of purification. The fact that the plant has been erected at the East Hull works (though the final details of construction were not sufficiently complete for the plant to be in operation on Friday) shows that confidence has been established in Mr. Holliday's mind that, under—and this we emphasize—the conditions in which he investigated the system at Königsberg on a plant of smaller capacity (this one at East Hull is equal to dealing with about 1½ million cubic feet of gas per day), the claims are confirmed. But what he has to prove now is whether or not the same successful operation will be repeated using English coals; and whether the plant will suffer any undue depreciation by reason of the chemical operations conducted in and by it. Radically, the present system for the purifying of gas from sulphuretted hydrogen and the one now claiming notice are so dissimilar, that there is nothing to be gained by any comparison of the individual items of finance—such as capital expenditure, cost of maintenance, expense of operation, and so forth; nothing but a final balance-sheet will enable judgment to be passed on the relative financial aspects. But again, in that regard, the presence of the plant at East Hull marks the confidence of the technical adviser of the Company. This, however, should be made quite plain—that he does not at the present time commit himself to any definite statement either on the point of efficient working or ultimate financial economy; and only confirmation under these heads will entitle the plant to continuance at the works. This, we think, makes Mr. Holliday's position perfectly clear.

As has been said, the system is a self-contained one from beginning to end. This was seen from the description published last week; and, through a communication from Herr Feld published in this issue, it is learned that an extension of the functions of the plant has just been made by which ammonia and sulphuretted hydrogen can, it is claimed, be extracted simultaneously—the ammonia being obtained in the form of a strong solution of sulphate of ammonia, without further distillation, and without using sulphuric acid for its formation, the sulphur extracted from the gas being used for the purpose. But this functional extension has no part in the plant as erected at East Hull; and therefore to the simple system of sulphuretted hydrogen purification and recovery of sulphur there, this notice may be confined. In it, thiosulphate of zinc is the active reagent used, which is produced as part of the system in the plant itself. This zinc thiosulphate is the washing liquor for the gas, and is used in two of the Feld centrifugual washers, passing successively from No. 1 to No. 2. The washing liquor reacts with the sulphuretted hydrogen contained in the gas, forming zinc sulphide and free sulphur as precipitates. The liquor itself undergoes regeneration by converting the zinc sulphide into zinc thiosulphate by the action upon it of sulphur dioxide. And so the cycle of operations continues without waste. When the liquor contains about 15 per cent. of sulphur, it is again treated with sulphur dioxide until the whole of the zinc sulphide is formed into zinc thiosulphate, while the sulphur is recovered in solid form, uncontaminated with zinc sulphide—the liquor being once more reused for washing the gas. That, in brief, is the chain of operations and reactions; and it must be admitted that simplicity is one of the strong features of the process as a whole.

There for the present we leave this new system. It is early to speculate or to form assumptions. The process is in safe hands with Mr. Holliday; and it will soon commence making its history and adding to our knowledge. As we have said, oxide purification is cheap and efficient, but cumbersome. Efficiency and financial result are the issues between the established process and the new one.

Angered Shareholders.

The deluded holders of shares in the Eaton group of promotions are indignant over the position in which they find themselves. They have learned by experience that confidence must not be placed in every prospectus that holds out lustrous promise, though founded on an industry that has a history of solidity and great success at its back. The shareholders of the Ticehurst Company met last Tuesday, at the bidding of one of their number (Mr. C. S. Glover), to discuss the position to which they have been gradually lowered by the scheming of Eaton and his confederates; and if the attitude of the speakers at the meeting may be taken as an earnest of the determination of their future procedure, it is clear that no stone will be left unturned to ascertain distinctly whether or not Eaton and his associates have brought themselves within the reach of the arm of the law, and the extent of the assets that represent the heavy capital expenditure that has gone through one or other of the channels so cleverly provided for the purpose by the promoters. It is feared that the assets of the Ticehurst Company will prove microscopic in contrast with the money that has been wafted no shareholder knows exactly whither, but all can give a shrewd guess. From the discussion at the meeting, it is clear that these No. 99, Cannon Street promoters have offended in almost every conceivable way against the proprieties of Company promotion and administration. The shareholders' interests have been sacrificed and made subservient to the parasitical designs of these promoters; but the tale is only common, in more or less degree, to this group of flotations. Some of the shareholders who spoke at the meeting have dropped money into more than one of the concerns; and they bear the same testimony as to, in cases, debenture interest not being forthcoming without pressure, of no profits being made from the sickly concerns with enormous capitals for the business done, of wasteful capital expenditure through the notorious Works Construction Company, of indifference to shareholders' appeals, and of every possible excuse being made in temporizing with importunate shareholders. One of the most pitiful features of the tale is the number of women and poor working men who have been beguiled by specious prospectus, and the inducement of a remarkable dividend, to "invest" their hard-earned savings. Who is to protect such folk from the arts and wiles of these promoters? The Chairman at the Ticehurst meeting declared that he had been advised that the prospectuses of this Company were legally misleading. Whether or not the astute ones at No. 99, Cannon Street have managed to keep just within the bounds of the law is not for us to say; but there is no doubt whatever about it that prospectuses issued by them have been misleading to a large number of people, and results have negatived the subtle promises held out at the time of flotation. If deception such as this can have a humorous side, it has been (to those with technical knowledge) the use that has been made of the most common titles to names in the prospectuses to allure the public. One of the shareholders pointed out that Eaton, the promoter, although not a member of the Institution of Civil Engineers, affixed "C. E." to his name. It is true that his latter years have been spent in engineering things to his personal advantage; and possibly he thinks that he has as much right to the self-application of a useless and meaningless title as other men who indulge in the foolishness without any attestation to qualification that gives the right.

Some Reflections on a Visit to Leeds University.

Our electrical friends must be getting a bit tired of hearing about the scientific aid that the gas industry has provided through the Leeds University; but they can console themselves that they are not badly looked after at the National Physical Laboratory—and not through any special financial provision by the electrical industry. The "Engineering

"Correspondent" of the "Daily Telegraph" lately went to the Leeds University; and has been pleasurably struck with what Dr. W. A. Bone had to show him as to what is being done there for carrying on work for the gas industry in connection with the endowment of the chair of Gas Engineering and Fuel, as a memorial to the late Sir George Livesey. The visitor viewed the arrangements for investigations on gaseous explosions under high pressures, which, it is hoped, will throw much light on the chemical aspect of gas-engine problems. The photometrical appliances fitted up by Dr. Bone, which installation has been designed so that it can easily be adapted to new arrangements, attracted the visitor; and the possibilities of persistent work by its assistance opened up to him a bright vista. We recognize with gratitude in the gas industry that the two most powerful aids that we have in the lighting field are the products of the laboratory—the bunsen burner and the mantle; and there is not the slightest doubt that the co-operation that has been assured between the practical workers of the gas industry and the highly skilled chemists and physicists at the Leeds University, will redound to the credit and the benefit of both the University and the gas industry.

What he saw and what he heard at the Leeds University led the "Engineering Correspondent" of our morning contemporary to reflect on the advantage to gas and electricity consumers of such ceaseless scientific activity, fostered by the competition between the two rival divisions of lighting. He finds that the advocates of each illuminating agent are restless in their endeavours to convince the householder of the great advantage to be gained by using some new improvement. But in his article, while he says much in praise of the new electric metallic filament lamp, he overlooks the claim to specific notice of the newest forms of inverted gas-lamps now in competition with the electric metallic filament lamp. It may be quite true there are now over 4 million metallic filament lamps in use in this country; but it is not a startling number. To make a computation of the myriads of incandescent gas-lamps in use in this country would be a matter of supreme difficulty. Then the writer proceeds to say that the houses of the very poor may now be fitted with electric lamps. There is a stretching of the imagination here. In looking for an explanation of his meaning, it is found that the writer calculates that with electricity, using a metallic filament lamp, at 3d. per unit twenty hours of light can be obtained by the payment of 1d. for the current consumed. But what a light? Spreading the pennyworth of electricity over twenty hours, the allowance per hour comes out to only 16 watts, or about sufficient for a 12-candle power lamp. With a pennyworth of gas at 2s. 6d. per 1000 cubic feet, using the bijou inverted burner, a light of from 20 to 25 candles can be obtained for thirty hours. It is because of this cheapness, and because consumers can use these "new improvements without having to pay for expen-"sive fittings," that electricity, notwithstanding the assistance of the metallic filament lamp, finds it so difficult to make conspicuous headway in the domain of private lighting. The engineering contributor of our contemporary also remarks that the scientific reputation of the gas engineer is at stake. We do not know what he had in mind in making this remark; but there is truth in his previous assertion that gas engineers are not going to rest on their laurels. In the cause of progress, not only in the cooking, heating, and motive power branches of their business, gas engineers are as keen and alert as ever; and we may go farther and claim that their keenness and alertness are intensified by the successes in producing higher efficiencies and economies, as much as by the sharper competition they have to meet.

Welsbach Company and Electric Metallic Filaments.

The electricity supply industry has spasmodic attacks of jubilation; and one of them is on at the moment. The cause is that the Welsbach Company—a business concern with large resources and powers of distribution—have extended their business into the supply of electric metallic filament lamps. This is regarded by the more sanguine electrical spirits as highly significant, and as auguring the approach of the final collapse of the lighting business of the gas industry, notwithstanding that to-day there are a greater number of mantles sold than ever, that the authorities on mantle sales estimate the output in the United Kingdom at no less than 50 millions a year, and that never has there been a time when the implements of incandescent gas lighting have shown such efficiency as they do to-day. We fail to see why there should be any excitement whatever over the Company's fresh move. They are only doing now what many makers of gas lighting fittings did years ago—that was, took the opportunity offered by electric lighting of enlarging the area of their businesses, and yet the gas-lighting business of such firms has remained the chief source of their revenue, and has continued to increase abundantly side by side with the smaller and less progressive and lucrative electrical branch. Most municipal owners of gas-works are also owners of electricity works. There are also gas companies who have taken powers to supply electricity. And all on account of much the same influence that has operated in inducing the Welsbach Company to extend their enterprise into the supply of the electric metallic filament lamp—that is, to be in the position to supply a demand, leaving the consumer to exercise his own preference as between gas and electricity. Having entered into this new business, the future policy of the Welsbach Company is that of purely independent commerce in lighting, as is evidenced by the following paragraph that appears in a circular issued by them on their new venture:

> As a business move, there can be no question of the soundness of the Welsbach policy, because, whilst there is not, and cannot be, any suggestion that electricity is as yet anything like so cheap as incandescent gas, still the Welsbach is a business company, and there are factors other than cheapness to be taken into consideration, notably the greater cleanliness of electric light.

Not a New Idea, and Changed Conditions.

Sentiment cannot enter very largely into business; but from the purely sentimental point of view, the Welsbach Company see a fitness about the expansion of their trading into that of electric metallic filaments, inasmuch as Baron Welsbach was the inventor of the incandescent gas-mantle, and likewise of the first metallic filament lamp—the Osmium. For that reason alone there is no room for surprise at the Company taking up the marketing of both forms of lamp. The idea of doing so is not by any means a new one with them. In 1901 the question was before the Board; and as recently as the meeting of the shareholders last May, the Chairman (the Right. Hon. Lord Weardale) stated that: "Numerous propositions had been made to the Company to take up the manufacture of electric metallic filament lamps. Although the Board recognized it was their duty to examine these suggestions, nothing had so far been put before them to justify them making such a radical departure." A proposition that would commend itself was apparently nearer than Lord Weardale imagined at the time. The change does not by any means point to the Company doing any less business than before in gas mantles; for immediately preceding the quoted declaration, his Lordship had stated that they had sold during the year more mantles than ever before, but competition and the craze for the lower priced mantles had had effect. The Company are now working in the open market; and the present Board are suffering from the administrative and financial extravagances and indiscretions of their predecessors in office of years ago. Between the cheaper mantle trade and the heavy capital, the difficulties of the Board are sandwiched; and hence the desire to broaden the basis of business as much as possible. The Company's present action will only be a seven days' wonder; and their big interests in the gas industry and in the Austrian Fluid Company must ever give to the gas mantle prior place in their considerations and operations. It is curious that the electricity supply industry should be so jubilant at receiving assistance from a Company whose roots are irremovably planted in the gas industry. The section of the electrical industry that will not receive the Welsbach Company with open arms is the one engaged in the manufacture and sale of electric metallic filament lamps. The prices of these lamps have been knocked about already pretty severely; and therefore the low price of the Welsbach variety will not be very acceptable to the makers of those previously in the field. It will be interesting to watch the course of events in this connection with the new business being conducted through the far-reaching distribution channels that the Company command in association with the incandescent gas mantle business.

An Elective Auditor on Manchester Affairs.

As an Elective Auditor, Mr. S. Norbury Williams, who represents the Manchester citizens in this connection, must surely hold a record. The election shortly to be made will be his

seventeenth; and on no less than ten occasions he has fought for his position. Perhaps, however, "fight" is hardly the correct term to use, inasmuch as no candidate is permitted to spend a single farthing on making his candidature known, so that the contests cannot possibly be of a very strenuous or exciting character. But in spite of this prohibition of the tactics which one is accustomed to associate with elections, there is a method open of making both the election and the views of a particular candidate widely known; and of this means Mr. Norbury Williams is not slow to avail himself. In the course of a three-column article in the "Manchester City News" last Saturday, under the heading of "Spending and Wasting," he expresses his opinions on the labours of the Council with a candour that is quite invigorating. True, much that is said has been said before—and by the same gentleman; but this repetition will be admitted as inevitable, when one considers the number of years the author of the article has interested himself in the work of Elective Auditing. Naturally, the "steady, persistent, and almost dreadful" rise in the rates is enlarged upon to considerable extent; but other points also receive attention. Mr. Norbury Williams draws attention to an article written by him as long ago as 1886, in which an opinion was expressed with which many people at the present day will be inclined to agree. He says: "I tried to induce my fellow-citizens to banish Imperial politics from municipal elections, and warned them of the inevitable rise in the rates if they persisted in sending men to the Council because of their political colour, and not on account of their municipal suitableness and ability. But the old game is still being played. The lists of candidates for the forthcoming elections, which appear in the papers, are still marked with the orthodox letters, 'L' and 'C.'" What he would like to see in the Council is a body of men of all parties who should band themselves together for the specific purpose of carrying certain urgently pressing reforms, and who would give themselves no rest until these were accomplished. Among the list should be uniform rating throughout the city and uniform representation of the citizens, to be secured by an equitable remodelling of the wards. On general principles such as these, the Elective Auditor is on comparatively safe ground; but we are not sure that he is always quite so successful when dealing with specific matters relating to individual trading departments. The salaries paid to the gas collectors seem to form a subject which could well be left to the Committee who are entrusted with the administration of the undertaking; while as for his lengthy remarks on the illuminating power of the gas, they cannot be said to assist in elucidating the "mystery" which appears to him to exist about the question.

The Secretaryship of the Société Technique.—We learn that M. Payet, the Secretary of the Société Technique du Gaz en France, has been appointed Technical Director of the Company recently formed for promoting the sale in France of the motors constructed by the "National" Gas-Engine Company, of Ashton-under-Lyne. Under these circumstances, he will relinquish his present position, which he has occupied for about seven years. In wishing him success in his new sphere, we take the opportunity of again expressing our appreciation of the courtesy he has always shown to the representative of the "JOURNAL" who has attended the annual meetings of the Society.

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary (Mr. J. Alsop) that the first meeting of the Association for the ensuing session will take place next Saturday, when the members will accept the invitation of the President (Mr. J. Taylor, of Mossley) to visit his works, where they will be received by the Chairman and members of the Works Sub-Committee. At the close of the inspection, they will leave for the water-works light railway, where, by the kindness of Messrs. Morrison and Masons (through Mr. A. Lang, the Resident Engineer), carriages will be in readiness to convey them to the site of the Chew reservoir, now under construction. On arriving, it is expected the Engineer to the Ashton-under-Lyne, Stalybridge, and Dukinfield Joint Water Committee (Mr. F. J. Dixon) will meet the party, and fully describe the works. The first "Coffee Meeting" of the Association will be held on the 12th prox., in the City Café, Deansgate, Manchester, when the evening will be devoted to the study of several of the latest and most improved instruments used in chemical laboratories, outside departments, &c. Some important instruments, not as yet to be found in any gas-works in this country, will be on view. The programme for the session shows that arrangements have been made for some interesting visits, one being to the Manchester University, when Professor Harold B. Dixon, F.R.S., will deliver a lecture on "The Chemistry of Flame."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 850.)

MOVEMENTS on the Stock Exchange last week were irregular, in response to the varying influences of the moment. The stronger factors, however, were calculated to depress rather than to cheer—such as the steady hardening of gold, disquietude in regard to politics, and unsatisfactory railway statistics. On the opening day, business was a shade quicker and brighter, but mostly in the more speculative lines. Consols were $\frac{1}{8}$ worse. Railways rose on the postponement of the Welsh coal struggle (one of the parties declining to fight); and the American Market was buoyant—indeed, flamboyant. On Tuesday, the general tone was tolerably good; but Rails were rather shaky. Wednesday was weaker, and prices showed a shrinkage in many lines. Consols dropped $\frac{3}{16}$; Railways were flat; and Americans see-sawed up and down. On Thursday, markets were sleepy for the most part, and prices drooped from sheer inanition. Consols fell $\frac{1}{8}$. On Friday, general languor was the characteristic in most lines—tired of the long account, as some said—with still more weakness in the gilt-edged division, and a further fall in Consols. Saturday was the great Jewish fast-day, and everything was very quiet. Consols were repeatedly marked below 83. In the Money Market, the abundant supply to meet demands for the short loans was undiminished; but the run on gold, and the raising of the Berlin bank rate, tended to harden discount materially. The latest quotations, however, ruled easier. In the Gas Market, business showed a falling-off in point of volume. The general tendency was quite steady, and hardly any changes in quotations were made. In Gaslight and Coke issues, moderate business was done in the ordinary at very steady prices, ranging only between $105\frac{3}{4}$ and $106\frac{1}{4}$. The secured issues exhibited their usual quietude; the maximum being done at from $88\frac{1}{2}$ to 89, the preference at from 104 to 105, and the debenture at 86 to $86\frac{3}{4}$. The quotation of the latter was adjusted into line with that of the similar issue of South Metropolitan. The ordinary stock of the last-mentioned Company was firm and unchanged, transactions showing a range from $119\frac{1}{2}$ to $120\frac{3}{4}$. The debenture was done at 85. In Commercials, the only issue dealt in was the 4 per cent., which changed hands at 109 and $109\frac{1}{4}$. The Suburban and Provincial group were, perhaps, quieter than ever; the only transactions marked being a couple of bargains in West Ham at $124\frac{1}{4}$. But the quotations of Bromley "A," Sheffield "A," and Wandsworth "B" rose a point each; and of Alliance and Dublin old half-a-point. The Continental companies were again very quiet. Imperial, which had been rather shaky lately, gave way a point, with transactions from 180 to $178\frac{1}{4}$; Union was done once at $95\frac{3}{4}$; and European fully-paid marked $24\frac{5}{8}$ and $24\frac{7}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at $13\frac{3}{4}$, Cape Town debenture at $48\frac{1}{2}$, Melbourne 5 per cent. at 103, Monte Video at 13 and $13\frac{1}{8}$, Primitiva at from $7\frac{3}{16}$ to $7\frac{5}{16}$, ditto preference at $5\frac{1}{4}$, and River Plate at $16\frac{7}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Heating and Cooking—The Cooker Par Excellence—Further Views on the "Therol" Water-Heater, and its Claims—A Trip to Berlin—A Virtuous Protest.

THIS is the season of the year when perhaps more than at any other attention seriously turns to questions of heating and eating. Gas-fires are being overhauled; and coal cellars filled. Electrical radiators are being disconnected, and gas-fires fitted in their place, with exceeding advantage from the pocket and comfort points of view. The improvements that are being effected in gas-fires by the manufacturers are receiving notice in our columns; but we do not find any startling innovations in the electrical heating line. The electric radiators seem to have fallen into hard-and-fast grooves, in regard to design, consumption, and low efficiency; and nothing short of a miracle can alter the two latter conditions. A week ago we were noticing the last achievement in respect of the electrical heating of water; and a further reference will be made in a succeeding paragraph. But, as we say, the season is one when thoughts turn, more than at any other period of the year, to entertainment at the well-laden board; and so it is not inappropriate to glance at one of the latest electric cooking productions. This is the "Tricity" cooker. In the past there have been remarks in the "Memoranda" as to the lack of mechanical strength in electric cooking apparatus, as to the consumption of current being too large, as to slow action, and as to low temperature, which allegations have been categorically and successively (not successfully) denied. Of course, we cannot expect from our electrical friends "any negation of the faith" (as Lord Rosebery would say) that is within them. The manufacturers of the "Tricity" cooker, however, now declare that the troubles enumerated have hitherto really attached to electric cooking apparatus; and the "Electrical Times" declares that the said manufacturers on these points "truly remark." We are satisfied. But, of course, the "Tricity" cooker has eliminated all troubles.

From our contemporary's description, it is gathered that special pots and pans are not required with the new-comer, so long as

their bottoms are as flat as possible. That can easily be arranged. The trailing flexibles which are "so fruitful a source of minor accidents, are dispensed with;" and one flexible between plug and cooker is all that is required. The heater is also stated to be an interesting adaptation of the transformer, and is intended solely for use on alternating current systems. That is a limitation. The consumption of the cooker is about 900 watts at full, and 150 watts at the lowest, heat; there being six degrees of heat obtained by the manipulation of two switches. It is observed that there are none of the old comparisons with gas published in this notice of the new cooker. So often have electrical friends been tripped up through manufacturers' figures, that perhaps they have now concluded there is wisdom in restraint. It is considered obvious, however, that the life of a "Tricity" cooker must approximate to that of a transformer operating under favourable conditions, "which is a very considerable period of time—far beyond that of a much used gas ring." This is all too funny; but laughter is stayed by the serious search that is being mentally made for any part of a gas-ring that is likely to wear out. With a gas-ring there is no need to protect the user from shocks; while in the case of this paragon of an electric cooker, there has been devoted to its construction as much consideration as is given to the building of a "Dreadnought." We read that particular care has been paid to the making of the apparatus safe from shocks; all live parts being completely protected by the iron case. The flexible also is stoutly armoured, and is well able to stand ordinary usage. The statements may be accepted for the nonce. Curiously the article succeeding the description of the "Tricity" cooker is headed "Treatment for Electric Shock." In the opening lines, we learn that our contemporary has prepared for the use of electric power suppliers a wall card giving instructions as to treatment in the event of a person receiving an electric shock. It is not supposed that this is intended for use in the ordinary household, though we have heard, through a certain chief inspector, of deaths from electricity at 200 volts and thereabouts. But perhaps it would not be inappropriate to prepare a mural card, giving a few suitable expressions for use in the domestic circle in the event of shock resulting in death when using electrical apparatus.

A study of the "Therol" electric water heater, and of the extraordinary claims held out for it, did not permit the discovery on our part of anything to cause acknowledgment, in our references last week, of participation in the sanguine hopes of some of our easily elated electrical contemporaries as to the convenience it would afford in the household equipment, nor as to it doing much towards rendering assistance in attaining the deeply rooted desire of central station engineers in the matter of a 100 per cent. load factor. A central station engineer has not to ponder long over the performances and needs of this water-heater to make him conscious, although he may not give publicity to his views, that it has in its infantile stage been much over-rated. A letter by Mr. A. H. Dykes (the Electrical Engineer who was responsible for carrying out the installation of the electricity works of the Ascot Gas and Electricity Company), published in one of our electrical contemporaries, suggests to us that he is not so enamoured of the new appliance as some of the writers who preceded him with accounts of their judgments. The "only criticism," he says, that one might venture to make, is that where water is hard trouble might arise through scale depositing in the coil pipe in which the water is heated, more particularly as the temperature at times rises to a fairly high limit. Though that is the "only" criticism Mr. Dykes started out to make, he indulges in a little contradiction of his own words by "venturing" to make others. As was pointed out last week, the 25-gallon size heater takes 200 watts an hour, which would amount to 1772 units per annum, running continuously throughout the year. Having regard to this figure, Mr. Dykes fears it would not prove very profitable to a company to hire out the apparatus and supply current for an annual payment of approximately £4 10s., except in cases where it could be arranged that the heater could be switched off during peak load. He makes his case as follows on this point:

> It must not be forgotten that, when quoting a low rate for power purposes, such as £4 10s. per kilowatt of demand, and 0·3d. per unit, the kilowatt charge is based on the fact that the diversity factor of the power load is very much greater than for a lighting load; the charge for a purely lighting load being probably £12 per kilowatt, and 0·5d. per unit. If these heaters are to run 24 hours during the day, their diversity factor is unity; and the cost therefore would probably work out, at 0·2 kilowatt, as follows: £12 = £2 8s., *plus* 1772 units at 0·3d. per unit equals £2 4s. 3d., making a total of £4 12s. 3d., to which would have to be added the cost of upkeep of the apparatus, and interest and sinking fund payments on the outlay, which, allowing for the cost of installing and wiring, would certainly not be less than £16 to £18.

An electrical undertaking cannot, of course, be constantly run on the philanthropic lines seen in some of the charges for power purposes and heating. The end of such a method of conducting any business can only be insolvency. The electricity consumer has always been the victim of the pretty projects for complication of the electrical engineer, in the effort to make things better for the central station. These complications confuse the consumer; and in some respects lessen his convenience, by making it subservient to cast-iron rule. In getting this 100 per cent. load factor through the "Therol" water-heater, it will be remembered that it was suggested that the current could be cut off from the heater and used for other purposes, such as lighting—the supply of hot water meantime being limited to the quantity of heat stored in the "Therol;" and the lighting capacity to five 32-candle power metallic filament lamps! Bearing on this point, Mr. Dykes remarks that "it looks as though it should be a very simple matter to arrange the limit-indicator in the lighting circuit, so that, whenever the current required for lighting was less than a certain amount, the current was switched on to the heater, and that when the current exceeded a given amount, the heater was cut off, so that the agreed maximum demand was not exceeded." Very good. The more complication and restriction, the greater the dissatisfaction of the consumer. So we—with our low flat-rates for gas, and an unrestricted use at any time for all purposes in a household—have nothing to complain about.

There are none so blind as those who will not try to see. A London electric firm, through G. A. Hughes, have recently addressed a letter to the electrical papers, ostensibly with a view to putting a little heart into their readers over the report and recommendations of the City Corporation deputation to the Continent to inquire into the matter of street lighting. The "firm" have, or Mr. Hughes has, been to Berlin. What they or he were or was doing in Berlin is not explained; but it is deplorable to find that they or he only found that the "less important streets were lighted by gas." But the electrical readers of this remarkable pronouncement have not gone into ecstasies over what the "firm" or Mr. Hughes found, as the authentic information contained in the report of the City deputation is not so ancient that interested electricians have not in memory two or three of the salient statistics obtained from official sources. The figures are sufficiently interesting to refer to again. The total number of electric arc lamps (open and flame) in Berlin is 864, of which 664 are fixed upon standards, and 200 are suspended in central positions in the streets. In addition, 212 electric glow lamps are in use. To set against these figures, we read that "high-pressure gas lighting is very largely and effectively used in Berlin—25 miles of streets being lit by 1531 lamps fitted with upright and inverted burners, two and three burners in each lantern;" and that "incandescent gas lighting (low-pressure) is used for the side streets, there being about 466 miles of streets lighted by 3000 upright burners and 2000 inverted burner lamps." Now what were the "firm" or Mr. Hughes about that they should only have been able to see that "the less important streets were lighted by gas?" But we go on to read in the letter: "Judging from the effect, we can only imagine that the Berlin City Fathers, being progressive (as is shown by the beauty of their charming city), are not likely to take the retrograde step of putting in more gas lighting than they can possibly help." Let us see from the report what the acknowledged progressive Berlin City Fathers are doing: "The Berlin authorities," it is stated, "have decided to spend 7 million marks (£350,000) in installing the latest patterns of high-pressure gas-lamps, with inverted burners, in lieu of the existing gas *and electric* lamps. Expenditure in this direction has been going on for the last two years at the rate of a million marks (£50,000) a year, and will be continued at the same rate for the next five years." After this there is no necessity to say more about this letter, excepting to point out that there is a little advertisement tacked on to the end, which confirms the statement we made at the time the report was issued, that there is no insuperable difficulty in the central suspension of gas-lamps. The letter says: "Our lowering gear is equally applicable to gas as to electric light, by the substitution of a gas connection for the usual electrical coupling; and there is no difficulty to us in dealing with this problem either for swan-neck poles, centrally hung carriers, or cross-street suspension gear." Perhaps our electrical friends, upon this testimony from an electrical source, will now cease their thankfulness over the erroneous assumption that gas will be "done" by the condition that is attached to the recommendation of the City deputation, as to centrally hung lamps being manipulated by lowering gear.

There is sympathy with our friends of the "Electrician." They refuse to be parties to any fraud being perpetrated on the public in the matter of the candle power of metallic filament lamps. They are righteously indignant over the retrograde step that appears to be taking place in this regard; and it is feared by them that the term "candle power" as applied to these lamps will become merely a nominal expression. It has been a misnomer in most instances from the importation of the metallic filament lamp from Germany. First there was an attempt made to palm off the Hefner unit as a British standard candle; and (may we venture to say it?) certain electrical writers did not then know "which from t'other, and t'other from which." Now it is alleged that some of the English manufacturers of these lamps are copying foreign lamps "even as regards their rating in Hefner candle power." Hefner "unit" power, please! There is no such thing as a Hefner candle. But (this is bad) our contemporary understands that metallic filament lamps of English manufacture do not, in some cases, reach, even on the Hefner basis, their stated "candle power." "Thus, 100-volt lamps of so-called 16-candle power, frequently give, on being tested, only from 13 to 14 English, or International, candles, although they should give about 14·4 if rated originally on the Hefner basis." That use of the word "International" is a bit pedantic; and it is rather early to employ it in such a connection. Let us wait and see whether the term is justified by international adoption. The fear of our contemporary is that the delinquency to which attention is called may do harm by fostering the impression that electric lamps do not give sufficient light compared with the incandescent gas-lamps now so largely used.

PRESENTATION TO MR. W. DOIG GIBB.

At the Meeting of the Board of the Newcastle-upon-Tyne and Gateshead Gas Company last Tuesday, a presentation was made to the Engineer, Mr. W. Doig Gibb, on his leaving the Company's service to take the position of Chief Engineer to the South Metropolitan Gas Company.

In making the presentation, Sir William H. Stephenson, the Chairman, said the meeting would probably be the last which Mr. Gibb would attend as Engineer of the Company; and before he finally took his leave he (Sir William) and his colleagues on the Board wished to give, in some tangible form, an expression of the appreciation of Mr. Gibb's services during the seventeen years he had been connected with the Company. The silver salver which he was about to have the pleasure of presenting to Mr. Gibb was not of great intrinsic value. It was not, however, a matter of the intrinsic value of the gift, but the expression of the feelings which lay behind the giving. It was in their case an expression of good-will and appreciation of all the work which had devolved upon Mr. Gibb during the period of his connection with the Company, and which they thought would act as an incentive in the enlarged sphere of activity to which Mr. Gibb was going, where they hoped he would have greater scope for the abilities which he eminently possessed, and have much success and long years of happiness with his new employers. When Mr. Gibb came to the Company seventeen years ago, he occupied a small position with them, and had a reputation to make. Now he (Sir William) was sure Mr. Gibb had a reputation to lose; and the Directors had little doubt that he would not only sustain but increase it. The fact that he had reached the summit of his profession, and been President of the Institution of Gas Engineers, showed how his capabilities had been appreciated. In Mr. Gibb's quiet moments at home, the salver placed upon his sideboard would always remind him of his work with the Newcastle and Gateshead Gas Company and those connected with the Company whom he had left behind, and whose good wishes and kindly feelings towards him would, they trusted, help him to sustain the good name he had already acquired.

Sir William then handed to Mr. Gibb the salver to which he had referred, to keep and to pass on to his children and his children's children as an heirloom, to show the appreciation of the Directors of the Newcastle and Gateshead Gas Company of his services with the Company. He expressed the hope that Mr. Gibb would long be spared to occupy the highly important position which he was about to take, the appointment to which was the greatest compliment that could be paid to the record of his work in Newcastle.

The salver was of solid silver, and bore the inscription:

> **Presented by Sir W. H. Stephenson, D.L., D.C.L., Chairman, and the Directors of the Newcastle-upon-Tyne and Gateshead Gas Company, to W. D. Gibb, Esquire, M.Inst.C.E., on his leaving their employment, after seventeen years' service, to take up the position of Chief Engineer to the South Metropolitan Gas Company.—21st September, 1909.**

Mr. Gibb, in responding, said that when he went to Newcastle seventeen years ago it was, as Sir William Stephenson had stated, to take a small position and with a reputation to make. At that time he realized the difficulties of doing this; but, by the encouragement given him by his Directors, he had always endeavoured to do his best. He had already, in a letter to them, thanked them for the many kindnesses shown him during the time he had been with the Company, and for the opportunities they had afforded him, which had been the means to a large extent, of making his present position possible. He again expressed his appreciation of these kindnesses. He hoped that he would prove equal to the position he was about to take. He trusted that the confidence which the Directors of the Newcastle Gas Company had reposed in him would not be misplaced, and that the same confidence which he had merited in Newcastle would be placed in him by his new employers. He concluded by thanking the Directors for their very kindly gift, which he assured them would be regarded as an heirloom in his family, more especially as he understood it to be a personal gift from the Directors themselves

PERSONAL.

The marriage is announced—as having taken place on the 9th inst., at Epsom—of Mr. Ernest Frith, of Runcorn, to Miss Ethel Cogman, only daughter of Mr. Walter H. Cogman, of H.M. Customs and Excise.

At a special meeting of the Ashton-under-Lyne, Stalybridge, Dukinfield, and District Joint Water-Works Committee, held last Thursday, a resolution passed at a previous sitting, to accept the resignation of Mr. F. J. Dixon, the Water Engineer, was rescinded. It was stated that an amicable settlement of the differences which had arisen between Mr. Dixon and the Joint Board had been arrived at.

The Gas Committee of the Stockport Corporation have unanimously appointed Mr. Walter Stanley Sowerbutts Assistant Gas Engineer, in succession to Mr. E. G. Hutchinson, who, as already announced, has succeeded the late Mr. Keyte at Workington. The appointment, which, of course, is subject to the confirmation of the Town Council, is for a probationary period of six months, and will be made permanent at the end of that time. Mr. Sowerbutts is the youngest son of Mr. John Sowerbutts, J.P., of Stockport, and he received his technical education at the Stockport Technical School and the Manchester School of Technology. He has been at the Stockport Gas-Works for a period of 7½ years, during part of which time he was a pupil of Mr. S. Meunier, the Corporation Gas Engineer and Manager.

Mr. C. E. Ball, who has been for many years connected with the Ilfracombe Gas Company, and for some time held the position of Secretary, has been compelled to leave the town on account of ill-health. It was intended to offer him some token of regard at a dinner; but, owing to his state of health, a deputation, including Mr. J. Armstrong (the Engineer and Manager) and Mr. A. Norman (the Secretary), recently waited upon him at his house, and, on behalf of the Directors and staff, presented him with a massive solid silver inkstand, of Chippendale pattern, with two cut-glass bottles. The inkstand bore the following inscription: "Presented to Mr. C. E. Ball by the Directors, Staff, and Workmen of the Ilfracombe Gas Company, as a mark of esteem after 26 years' connection with the Company. September 18th, 1909." Mr. Ball, with much feeling, acknowledged the gift. The dinner took place in the evening at the Montebello Hotel—Mr. J. P. Ffinch, a Director of the Company, presiding. Mr. Ball and his family have since left Ilfracombe for Loughborough.

It is a pleasure to be able to record that Mr. Thomas Newbigging, who has been visiting Canada at the request of the Toronto Gas Company, to advise them in the matter of important extensions of their works, is back again in this country, delighted with his trip. As the result of his experience, he speaks enthusiastically of Canada. Business is "booming" there; and rapid developments are taking place in every direction. There is so much movement and confidence in the future, that it is a pleasure to be among it all. Naturally England, even the busy North, seems tame after this experience. Mr. Newbigging also speaks highly of the climate. Being bright and exhilarating, the feeling of lassitude so often felt here is entirely absent—from which it is evident that a trip to Canada is a "pick-me-up" of the very best kind. Though things may, generally speaking, run on quieter lines in England than over there, still Mr. Newbigging returns to find active times ahead of him. We learn that his firm are at present engaged on a valuation of the Manchester gas undertaking for rating purposes, and that they are preparing a scheme for the enlargement of the Douglas (Isle of Man) Gas-Works, where the consumption is increasing rapidly. In addition to this, they have four other extensions of gas-works on hand; and they have also reported recently on the proposed transfer of gas-works undertakings at Hoyland and Silkstone, Egremont (Cumberland), Penistone, and Thurlstone.

OBITUARY.

JOHN HENRY COX.

We regret to record the death on Sunday, the 19th inst., at his residence at Moorfields, Cotherstone, of Mr. John Henry Cox, Secretary and Manager of the Sunderland Gas Company. Deceased, who had reached the advanced age of 84, had throughout his long life enjoyed wonderfully good health; but a year ago he had an illness which prevented him, for the first time since he became associated with the Company, from attending the annual meeting. He recovered and was able to resume his duties until about a month ago, when he again became ill with bronchial trouble, and went to his country residence at Cotherstone in the hope of benefiting by the change. His condition improved considerably; but a relapse followed, and death resulted from heart failure.

Mr. Cox was born at Ryton-on-Tyne, and went to Sunderland when quite a young man. Soon after taking up his abode there, he obtained the position of Secretary of the Gas Company, with which he was associated for the long period of sixty years. At the time of his appointment (1849), there were two Gas Companies in the town; and the competition between them was very keen. After a time, however, the second undertaking was acquired by the present Company, which at that time was a struggling concern. Under Mr. Cox's able management, the business very rapidly increased until it reached its present dimensions. Mr. Cox's heart was always thoroughly in his work, to which he gave unremitting attention, being at his office early and late. It may be remembered that in the article on the installation of Dessau vertical retorts at the Company's Ayres Quay works which appeared in the "Journal" for the 6th of July, it was mentioned that the system had been adopted on the advice of the Engineer (Mr. C. Dru Drury), with the approval of Mr. Cox, whose interest in the Company, notwithstanding his sixty years' service, remained unabated, and to whom all matters of construction and policy were still finally referred. In 1899, on the occasion of the jubilee of his connection with the Company, the Directors presented him with a cheque for 250 guineas. Presentations were also made to him by the office staff, the workmen, and by the North of England Gas Managers' Association, of which he was one of the founders, a member of the first Committee, and a Past-President—the

Association's gift taking the form of an illuminated address. He joined the British Association of Gas Managers in 1866, and passed into the Gas Institute; but he left it in company with the other members who formed the first Institution. On the reunion taking place a few years ago, Mr. Cox enrolled himself as a member of the reorganized body. He was the oldest Director of the Sunderland and South Shields Water Company, a Director of the Elswick Coal Company, Newcastle, and a member of the Institution of Mining Engineers. He took no part in the public affairs of Sunderland, but was well known in all business circles in the town and district, and was held in high esteem among all classes of the community, and especially by his professional brethren, though, of course, he was less well known to the younger members of the gas industry than to their seniors. He leaves a widow, two sons, and one daughter. The eldest son is Dr. Burdon Cox and the younger Mr. Norman S. Cox, the Assistant-Secretary of the Sunderland Gas Company.

The funeral took place last Wednesday, at Bishopwearmouth Cemetery; the interment being preceded by a service in Christ Church, Sunderland. There was a large attendance of workmen, officials, directors, and others connected with the Sunderland Gas Company, as well as many other gentlemen desirous of showing the high esteem in which they held Mr. Cox. Among those present were Alderman Richardson (the Chairman of the Company), Mr. J. Morley Longden (Solicitor), Mr. Charles Hawksley (Consulting Engineer), Mr. C. Dru Drury (Engineer), and Messrs. R. H. Gayner and G. B. Gibbs (Chairman and Secretary of the Sunderland and South Shields Water Company). The North of England Gas Managers' Association were represented by the President and Vice-President (Messrs. T. H. Duxbury and John Lewis). The procession included upwards of 200 of the Gas Company's workmen, who marched behind the carriages.

The "Journal für Gasbeleuchtung" reports the recent death of Herr August Zschimmer, the Manager of the Fürstenwalde Gas-Works. He had reached the age of 75 years.

The death occurred rather suddenly recently, at his residence at King's Heath, Birmingham, of Mr. William Beal. Deceased was a native of London; but in 1862 he went to Birmingham, where he established himself as a manufacturer of gas-fittings. According to an obituary notice in the "Ironmonger," he for many years waged a vigorous warfare against the Birmingham Corporation on the question of municipal trading, particularly in regard to the erection and maintenance of gas-fittings and heating and cooking appliances. His place of business was in the centre of Birmingham, and he built up a large trade; but bit by bit it was taken from him by the Gas Department. He then fought the department in the Press, at public meetings, and at the November elections. Wherever opportunity offered, he was to the front denouncing the Municipality for using the money contributed by gas-fitters in the way of rates for the purpose of ruining them in their business. But he fought alone. The demand he made of the Corporation officials was that now made by the Ironmongers' Federated Association—viz., that the work of the Municipality should really stop at the meter. When in more recent years the Master Gas-Fitters' Association joined hands with the local Ironmongers' Association in an endeavour to obtain the removal of the same grievance, Mr. Beal took no part in the work. He felt that if the trade had rallied round him in the early days of the controversy, some good might have been done; but he thought that to attack the system when it had become the settled policy of the Corporation was useless.

Gaslight & Coke Company's Calorific Power Standard & Price.

In the "Journal" last week, we referred in detail to the above subject, and quoted sub-section 1 of section 39 of the Act amalgamating the Gaslight and Coke Company with the West Ham Gas Company, in which it is set forth that "as from the 1st day of January, 1910, the standard calorific power of the gas supplied by the Gaslight Company within the Gaslight district and the West Ham district shall be 125 calories net per cubic foot," &c. It appears, however, that the Company are about to anticipate the date mentioned in the Act, and have given notice to the Local Authorities accordingly; for, at the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee submitted a letter from the Company stating that the price of gas for street lighting would be reduced from 2s. 4d. to 2s. 2d. per 1000 cubic feet as from the date of recording the meter indices for the September quarter, and that the standard illuminating power of the gas supplied would be 14 candles, instead of 16 candles as at present. This action on the part of the Company brings to mind the statement made at the end of the report of the deputation of the Streets Committee of the Corporation on the lighting of Continental cities, given in the "Journal" for July 20 last: "The price of gas for public lighting up to Midsummer was 2s. 5d. per 1000 cubic feet; but this amount was then reduced by 1d., and a further reduction of 2d. per 1000 cubic feet will be made as from Jan. 1, 1910, when the Gaslight and Coke Company will reduce the illuminating value of their gas from 16 to 14 candles, under their Bill now before Parliament, which has passed the third reading of the House of Commons. The effect of these reductions will be to decrease the annual cost of the newest type of high-pressure inverted gas-lamp, as in Fleet Street, from £16 10s. to £15 2s. 6d., and all other gas-lamps proportionately."

THE LUNGE CELEBRATION AT ZURICH.

The seventieth anniversary of the birth, and the fiftieth of the doctorate, of Professor George Lunge, whose works on "Coal Tar and Ammonia" and "Sulphuric Acid and Alkali" are well known to many of our readers, was celebrated with much enthusiasm at Zurich on the 19th inst. According to an account of the proceedings specially contributed to the "Chemical Trade Journal," the official celebration took place in the gaily decorated lecture theatre of the Technical Chemical Laboratory; and when Professor Lunge advanced to the table from behind which he had for so many years addressed his students, the whole company rose to greet him with prolonged cheering and applause.

Professor Bosshard, Professor Lunge's successor in the Chair of Chemical Technology, opened the proceedings by congratulating the Professor in the name of the staff of the Federal Polytechnic and of the Federal officials. After referring to the vast influence which he had won, not only over the intellects but also over the hearts of his countless students, the speaker presented two birthday gifts. The first was a cheque for 40,000 frs. (£1600), collected among Professor Lunge's friends and disciples, and which was to form a "Lunge Fund," to be disposed of as its recipient might direct. The second gift was of a more personal nature, and took the form of a golden plaque, bearing on one side an excellent likeness of the master, and on the other showing him at work among the apparatus for which the world has to thank his genius. Professor Bosshard was followed by ten other speakers, each bearing the congratulations of a section of the chemical world, and bringing some lasting token of love and esteem.

On rising to reply, Professor Lunge was greeted with deafening applause. When the cheering finally subsided, the speaker said he dared not accept a fraction of the praise which his friends had showered upon him. Passing to reminiscences of his earlier life, he described his first connection with Zurich. He said that if he had had any success as a teacher, it had been largely due to the hearty co-operation of his colleagues, and, above all, of the unforgettable Victor Meyer. Finally he expressed his heartfelt thanks for the magnificent sum which had been, and was being, collected to do honour to his name. This he would ask the Federal authorities to invest—devoting the accruing interest to helping students who had secured their diploma, but who were unable, for lack of funds, to carry on post-graduate work.

As soon as the applause that this speech excited had ceased, Professor Bosshard rose to thank Professor Lunge for this new manifestation of untiring interest in the welfare of his students. The official celebration ended with a banquet, after which the gathering dispersed.

GAS ACTS FOR 1909.

[Second Article.]

We continue to-day a review of the Acts that have been obtained this session to give extended powers to a number of statutory Gas Companies.

If the Bill of the Alliance and Dublin Consumers' Gas Company (as noticed on Jan. 12 last) was of more than ordinary interest, the Act that has issued from it is even more so. The section of the Act dealing with works has been considerably modified. It will be remembered that the Company proposed to construct a conveyor or gantry over and along the side of Sir John Rogerson's Quay; and there were a number of clauses with reference to the carrying out of works on the River Liffey—all of which had for their purpose the provision of facilities for dealing with the transport of material to and from the works of the Company. Many of these clauses have been deleted; but there are other works described which will give the Company improved facilities in this respect, though not to the extent originally required. The cause of the alteration no doubt finds expression in this provision that appears in the Act: "Provided that, notwithstanding anything shown on the deposited plans, the Company shall not, under the powers of this Act, enter upon, or take, or use, Sir John Rogerson's Quay or any part thereof, or lay down or construct thereon any overhead construction or other work." Authorization is given to the Company to provide for the operation by electrical energy of the works described, provided that the electrical energy is so used as to prevent any interference with the telegraphs belonging to the Postmaster-General. The works in view are to be constructed within five years; otherwise the power lapses. Lands are described that the Company are given power to acquire; and sanction is granted to the construction of works upon scheduled lands. The extensions of the limits of supply named in the Bill are absent from the Act. The ordinary shares of the Company are to be consolidated and converted into stock of the nominal amount of £1,551,868, bearing a uniform dividend of 5 per cent. The Company's standard price was not mentioned in the Bill; but in the negotiations, it has suffered some reduction. A clause now provides that in Dublin, Rathmines and Rathgar, Pembroke, Blackrock, and in the District Electoral Division of Donnybrook, the standard price is to be 3s. 7d. per 1000 cubic feet: "Provided always that the price charged in the urban districts of Rathmines and Rathgar, Pembroke, Blackrock, and Kingstown, and in the District Electoral Division of Donnybrook, shall not exceed

the price for the time being, and from time to time charged, in the City of Dublin." The sliding-scale as to dividend is to operate half-yearly; 1d. variations from the standard price causing the standard dividend of 5 per cent. to rise or recede by 1s. 3d. per cent. The price charged for gas in Dalkey, Killiney, Ballybrack, and Terenure, is not to be more than 3d., and within the remainder of the county of Dublin (other than as specified above) not more than 6d., and in the county of Wicklow not more than 1s. 2d. per 1000 cubic feet, in excess of the price for the time being charged in the City of Dublin as now constituted; but the Company are, when the circumstances are similar, to allow like discounts within these limits of supply as within the city. These excess prices, however, are not to affect the dividend of the Company. Power is conceded for the raising of additional capital to the extent of £300,000, instead of £400,000 as requested in the Bill; and to the issue of the additional capital the new auction clauses will apply. The usual one-third borrowing power is allowed. Provision is made for a special reserve fund; and there is also the stipulation as to the carry-forward not exceeding the amount required to pay a year's dividend. The ordinary form of prepayment clause appears. The quality of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. Within twelve months of the passing of the Act, the Company may be required by any consumer to fix free of charge on his premises a sufficient number of flat-flame burners suitable for the prescribed illuminating power; and further—

The Company shall, if required by any person who shall be supplied with gas by means of a prepayment meter, supply, and fix free of charge in connection with such meter one incandescent burner with mantle and chimney in such position as such person may desire.

The Company have obtained relief in respect of sulphur compounds. As to the price of gas for public lighting, it is to be "at the lowest rate charged by the Company to any private consumers otherwise than by special contract in writing." It is also ordained that no capital raised under the Act is to be applied to the supply of electricity by the Company, or to the purchase, providing, or maintaining of any works, machinery, or appliances for that purpose unless with the sanction of the Board of Trade. It is also enacted that any part of the county of Wicklow (other than Bray) which is not, at the passing of the Act, supplied with gas by the Company shall, as from the passing of the Act, cease to be within the limits of the Company's supply. The arrangement entered into by the Corporation with the Company for the price of gas to be dependent on the price of coal during the next three years, does not form part of the Act; but an explanation as to its terms has been published on more than one occasion in our columns—briefly in the "JOURNAL" for Sept. 7, p. 620. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Eastbourne Gas Company's Act shows that the extension of the limits proposed in their Bill has been considerably curtailed, owing to the action of the outside authorities concerned. The Company will now embrace Arlington, Hailsham, Hellingly, and so much of Hurstmonceux as is not included in the limits of supply of the Bexhill Water and Gas Company. The Company are to be allowed to charge within the extended limits 5d. per 1000 cubic feet in excess of the sum from time to time charged by them for gas supplied within the existing limits; but any excess sum so charged is not to be taken into account in calculating the rate of dividend payable. To supply the new areas, the Company are empowered to lay connecting mains through certain districts that they had contemplated supplying, but which have been cut out of their project. The arrangement for the transfer of the Hailsham Gas Company's property is confirmed; and the holders of shares in the Company will receive in exchange for each £10 share £15 of 5 per cent. preference stock. Lands are scheduled on which additional works may be constructed. The Act has been considerably enlarged from its original form by the inclusion of pages of clauses for the protection of various authorities. Authorization has been given to the conversion of share capital into "A" and "B" stocks, carrying respectively standard dividends of 5 and 3½ per cent.; and, in consequence, the operation of the sliding-scale will now provide variations of 2s. 6d. in dividend instead of 5s. A special purposes fund is provided for; and it is enacted that the amount carried forward is not to exceed the equivalent of a year's dividend. For the testing of the Company's 14-candle standard gas, the use of the "Metropolitan" No. 2 burner is prescribed. The proposal for the adoption of the old 10 and 15 per cent. discounts clause has been dropped; and section 13 of the Gas-Works Clauses Act, 1847, has been extended in the manner proposed by the model clause so as to give liberty when making contracts. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In its effects, the most important Act of the session is that of the Gaslight and Coke Company. There are really three significant sections, in which there are sanctioned the scheme for the transfer of the West Ham Gas Company, the lowering of the illuminating standard of the gas supplied in the Gaslight and Coke area to 14 candles as tested by the "Metropolitan" No. 2 burner, and the inauguration of statutory penalty testing for calorific power. We will dismiss this last matter at once by a reminder that the calorific power clauses were reproduced *in extenso* in last week's issue. The West Ham Company will be absorbed as from Jan. 1 next; but it will continue incorporated until April 1 for the purpose of enforcing the provisions of any agreement which may have been entered into prior to the date of transfer. After that date there is to be final dissolution. In the whole, the holders of West Ham ordinary stock are to receive £121 of ordinary stock in the Gaslight and Coke Company for every £100 of West Ham stock held. To meet £118 of this amount, the necessary ordinary stock of the Gaslight Company is to be created; but the balance of £3 of stock is to be obtained by purchase in the open market by the Company out of the amount standing to the credit of the reserve fund. The holders of 5 per cent. preference stock in the West Ham Company are to receive at the rate of £125 per cent. of the 4 per cent. preference stock of the Gaslight and Coke Company; and holders of 4 per cent. debenture stock in the West Ham Company will receive at the rate of £133 6s. 8d. per cent. of the 3 per cent. debenture stock of the Gaslight Company. For fractional parts of £5 of stock, the Gaslight Company are to pay to the holder a sum in cash equal to its value at the market price on the day of transfer. Provision is made for the payment of the dividend of the West Ham proprietors to Dec. 31 next. The unexercised powers of the West Ham Company of raising capital and borrowing are repealed. The provisions of the Gaslight Acts are made to apply to the annexed district. The West Ham Council are to provide a testing-place at the Canning Town Public Hall; and the Company are to provide the necessary apparatus. Thereafter the testing-place at the Silvertown Gas-Works is to cease to be a prescribed testing-place. In the new testing-place, the mode of testing is to be the same as is prescribed by the Metropolitan Gas Referees. The Gas Examiner in the West Ham district may test for purity and pressure at any time of the day or night, and the illuminating power between the hours of five and eleven o'clock in the afternoon. But in the West Ham district, not more than one controlling authority is to be entitled to recover any forfeiture in respect of defective illuminating power, excess of impurity, insufficiency of pressure, or defective calorific power. One of the West Ham Directors [effect has already been given to this] is to join the Board of the Gaslight Company; and the remaining Directors of the West Ham Company are to receive, as compensation for loss of office, an equivalent of six years of their respective annual remuneration as Directors calculated upon the average of the three years immediately preceding the date of transfer, or in the case of any Director who has served for a period of less than three years, upon the average of such less period—the compensation to be paid within three months of the date of transfer. The Auditors are to receive a sum equal to three years' remuneration. The officers of the West Ham Company will go over to the Gaslight Company; but provision is made for retirement in the case of any officer with fourteen years' service at his back in the West Ham Company, upon either the Gaslight Company or the officer concerned so desiring, and for compensation by agreement or arbitration. For the protection of the West Ham Corporation, the following clause appears:

The Gaslight Company shall not close the existing works of the West Ham Company situate within the borough for the period of ten years from the date of transfer, but during such period the Company shall continue the manufacture of gas at such works, and carry on the same as a manufacturing gas-works, substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill for this Act.

A clause is inserted for the protection of the Chigwell, Loughton, and Woodford Company. It appears that the West Ham Company are, by agreement with the Chigwell Company, supplying gas in part of the area of the latter. This is to be continued by the Gaslight Company; and by arrangement there may be extensions. The Chigwell Company, however, have liberty given to them to give specified notification to the Gaslight Company to cease to supply gas in the area in question; but within a month of the expiration of the notice, the Chigwell Company are to pay the Gaslight Company the value of all mains, pipes, meters, fittings, works, materials, and apparatus of the Gaslight Company in the area in question. Failing agreement, the value is to be determined by arbitration. The standard price for gas of the Gaslight and Coke Company (under agreements effected with the London County Council) is reduced to 3s. 2d. per 1000 cubic feet; and the sliding-scale is to apply half yearly (the standard rate of dividend being 4 per cent.) by increments or decrements of 1s. 4d. per cent. for variations of 1d. down or up in price. The illuminating power of the gas is reduced to 14 candles. The burners of the prepayment consumers are to be changed within a reasonable period for suitable ones for the lower illuminating power gas; and other consumers can have any flat-flame burners exchanged for suitable ones within two years. Provision is made for the consumers south of the Thames obtaining a diminution of price in respect of the lowering of the gas from 16 to 14 candles, under section 39 of the scheme for the amalgamation of the London Gaslight Company with the Gaslight and Coke Company in 1883. The remuneration of the Directors of the Company is to be such a sum, not being more than £7500 or less than £5500, as the Directors may from time to time themselves determine. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The death occurred suddenly on the 19th inst., at his residence in Buxton, in his 74th year, of Mr. Keighley Walton, who was for many years Town Clerk of Halifax—a position which he relinquished in April last. Deceased served under 28 Mayors, and conducted proceedings in connection with 7 Local Acts and 14 Provisional Orders.

SIMULTANEOUS EXTRACTION OF AMMONIA AND SULPHURETTED HYDROGEN WITH SIMULTANEOUS OXIDATION OF THE LATTER INTO SULPHURIC ACID.

By WALTHER FELD, of Linz, Germany.

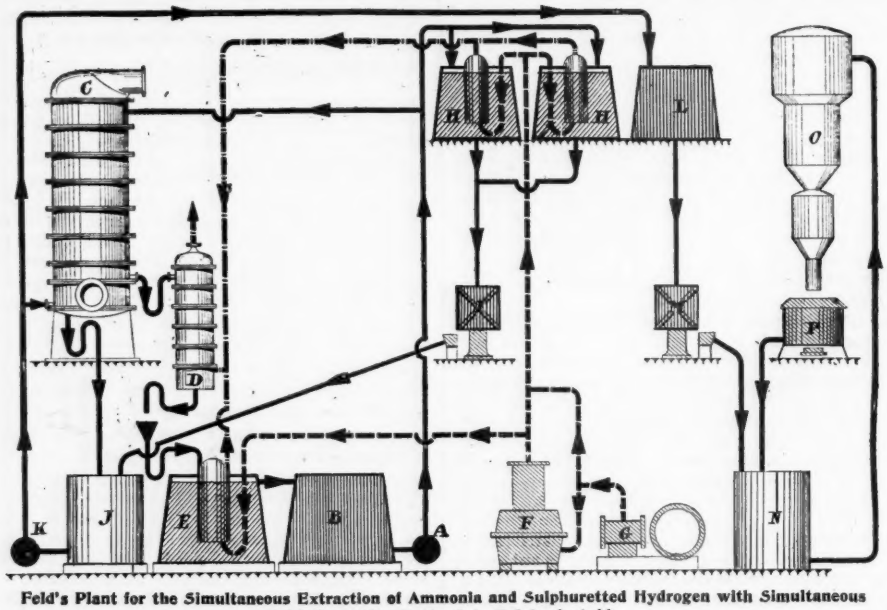
[Written in View of the Inspection of the East Hull Gas-Works by the Eastern Counties Gas Managers' Association.]

THE process inspected by the members of the Eastern Counties Gas Managers' Association at the East Hull Gas-Works consists of apparatus for the elimination of sulphuretted hydrogen only. Since this plant has been ordered, the process has been further improved; and it now extracts the ammonia and the sulphuretted hydrogen simultaneously—oxidizing at the same time an amount of sulphuretted hydrogen equivalent to the ammonia in the gas. The ammonia is thus obtained in the form of a strong solution of sulphate of ammonia, without any further distillation, and without using sulphuric acid for its formation—the sulphur extracted from the gas being utilized for this purpose.

The process is based on principles similar to those bearing on the elimination of sulphuretted hydrogen alone, as already explained to you.* The active reagents referred to in the following description are ferrous sulphate, thiosulphate, and thionates.

The gas containing ammonia and sulphuretted hydrogen is at first washed in a "Feld" washer with a weak solution of ferrous sulphate. Ammonia sulphate is formed, and iron sulphide is precipitated. The liquor running from the gas-washer is treated with sulphur dioxide (which is mixed with an excess of air) obtained by burning sulphur. By the simultaneous action of sulphur dioxide and air upon the iron sulphide, free sulphur is precipitated; and soluble ferrous thiosulphate, thionate, and sulphate is formed. The liquor so regenerated is again used for treating the crude gas; but the reaction is now somewhat different. The ammonia and sulphuretted hydrogen in the gas are again absorbed, and iron sulphide, together with free sulphur, is precipitated; while soluble sulphate, thiosulphate, and thionate of ammonia is formed. Whereas at the beginning of the process, when using ferrous sulphate only, about as much of the sulphuretted hydrogen is eliminated as is equivalent to the ammonia, now an excess of the former is extracted—being on an average as much as 135 per cent. on the ammonia. This is due to the presence of the thiosulphate and the thionates in the liquor.

The liquor is alternately treated with crude gas and sulphur dioxide until it contains between 30 and 45 per cent. of ammonia salts. It then represents a mixture of ammonia sulphate, thiosulphate, and thionate, some undecomposed iron salt, a precipitate of iron sulphide, and free sulphur, and is ready for oxidation. This oxidation is necessary to transform the thiosulphates and thionates into sulphates. With this object, the hot liquor is treated with sulphur dioxide and a surplus of air. By the simultaneous action of the sulphur dioxide and the oxygen of the air upon the hot liquor, the ferrous sulphide is dissolved, and the thiosulphates and thionates are oxidized into sulphate; free sulphur being precipitated. When the oxidation is complete, the liquor contains about 30 to 45 per cent. of sulphate of ammonia, the original amount of ferrous sulphate in solution, and all the sulphur extracted from the gas in the form of free precipitated sulphur. The sulphur is now separated from the liquor by filtration, and washed in a filter-press. Part of the sulphur thus recovered



Feld's Plant for the Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Simultaneous Oxidation of the Latter into Sulphuric Acid.

rom the gas is burnt in a sulphur-oven to sulphur dioxide, which is used in the process as mentioned above, and is finally oxidized into sulphuric acid, forming sulphate of ammonia. The rest of the sulphur is for sale.

The liquor coming from the filter-press, and containing soluble sulphates of ammonia and iron, is now ready for final treatment. For this purpose, the liquor is treated with crude gas, containing sulphuretted hydrogen and ammonia, by the action of which two compounds the ferrous sulphate is decomposed, forming again insoluble iron sulphide and soluble ammonia sulphate. As soon as all the iron is precipitated, it is separated from the liquor by filtration—the liquor then containing only a pure and strong solution of sulphate of ammonia, from which the sulphate is obtained by evaporation.

The residue in the filter-press, being iron sulphide with some ammonia sulphate liquor, is mixed with fresh water or virgin liquor, and treated with sulphur dioxide. Soluble ferrous, thiosulphate, thionate, and sulphate is formed, which is again used for the extraction of ammonia and sulphuretted hydrogen.

The following equations explain the process:—

(1) First washing:

$$2\,FeSO_4 + 4NH_3 + 2H_2S = 2FeS + 2(NH_4)_2SO_4.$$

(2) Regeneration of iron liquor:

$$2FeS + 3SO_2 = 2FeS_2O_3 + S.$$

(3) Second and further washings:

$$2\,FeS_2O_3 + 4NH_3 + 2H_2S = 2FeS + 2(NH_4)_2S_2O_3.$$

(4) Oxidation:

$$2FeS + 2(NH_4)_2S_2O_3 + 3SO_2 + 4O = 2(NH_4)_2SO_4 + 2FeSO_4 + 5S.$$

Then follows the filtration of the sulphur.

(5) Final precipitation of iron:

$$2(NH_4)2SO_4 + 2FeSO_4 + 4NH_3 + 2H_2S = 4(NH_4)_2SO_4 + 2FeS.$$

Then follows the filtration of FeS, leaving a pure solution of ammonium sulphate.

According to these equations, $2NH_3$ are equivalent to $1H_2S$, or 34 grains of ammonia are equivalent to 34 grains of sulphuretted hydrogen. Therefore, 1 grain of sulphuretted hydrogen should be absorbed by 1 grain of ammonia. It will be seen from the tables, that in using regenerated liquors, for each 100 parts of ammonia absorbed about 135 parts of sulphuretted hydrogen are eliminated from the gas. This proves that besides the simultaneous extraction of ammonia, and a corresponding part of sulphuretted hydrogen, a further elimination of the latter is going on in the same operation, according to the process adopted by the East Hull Gas Company.

The tables show the results that were obtained in a small plant in which sulphate of zinc and sulphate of iron were used for the washing process: Column 1 shows the strength of the liquor in $ZnSO_4\ 7H_2O$, or $FeSO_4\ 7H_2O$. Column 2 gives the amount of washing salt decomposed after having been in use for some time. Column 3 shows the quantity of gas treated per 24 hours. Column 4 shows the temperature at which the gas has been treated. Column 5 gives the ammonia in grammes per cubic metre of gas before and after treatment. Column 6 gives the same figures for sulphuretted hydrogen. Column 7 shows the percentage of

*See "JOURNAL," Sept. 21, p. 761.

TABLE A.—*Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Zinc Salt.*

[1 cubic metre = 35·3 cubic feet.]

—	Liquor.		Gas.				
	Zn SO_4 $7H_2O$.	Zn SO_4 $7H_2O$. Decomposed.	Quantity per 24 Hours.	Temperature.	Ammonia. Grs.	Sulphur. Grs.	Sulphur on NH_3 absorbed.
	Per Cent.	Per Cent.	cb.m.	Deg.	Per cb.m.	Per cb.m.	Per Cent.
March 23, 1909.							
Inlet of washer	17·9	..	1630	25	5·08	12·86	..
Outlet of washer	..	..	..	..	0·04	6·57	..
Extracted, g. p. cb.m.	..	..	..	..	5·04	6·29	123·7
Extracted, per cent.	..	..	..	..	99·22	48·7	..
March 24, 1909.							
After 24 hours :—							
Inlet of washer	..	..	1390	25	4·68	14·08	..
Outlet of washer	..	..	..	..	0·01	7·99	..
Extracted, g. p. cb.m.	..	..	..	..	4·67	6·09	130
Extracted, per cent.	..	..	..	..	99·72	43·02	..
April 9, 1909.							
(*a*) After 1 hour :—							
Inlet of washer	12·2	..	1225	24	3·76	11·73	..
Outlet of washer	..	..	..	..	0·14	6·48	..
Extracted, g. p. cb.m.	..	..	..	..	3·62	5·25	145
Extracted, per cent.	..	..	..	..	96·4	44·7	..
(*b*) After 3 hours :—							
Inlet of washer	..	..	..	..	4·01	13·43	..
Outlet of washer	..	..	..	..	0·19	6·93	..
Extracted, g. p. cb.m.	..	..	..	..	3·82	6·50	171
Extracted, per cent.	..	..	..	..	95·3	48·2	..
April 10, 1909.							
(*a*) Beginning of 1st hour:—							
Inlet of washer	11·3	..	50,000	35	..	..	..
(*b*) After 2 hours :—							
Inlet of washer	5·1	54·9	..	..	6·99	13·15	..
Outlet of washer	..	..	..	..	0·09	6·30	..
Extracted, g. p. cb.m.	..	..	..	..	6·90	6·85	99·2
Extracted, per cent.	..	..	..	..	98·70	51·9	..
(*c*) After 3 hours :—							
Inlet of washer	2·4	78·8	..	..	6·88	13·15	..
Outlet of washer	..	..	..	..	0·09	6·73	..
Extracted, g. p. cb.m.	..	..	..	..	6·79	6·42	94·4
Extracted, per cent.	..	..	..	..	98·6	49·1	..
(*d*) After 4 hours :—							
Inlet of washer	0·26	97·7	..	..	5·40	13·15	..
Outlet of washer	..	..	..	..	0·10	5·50	..
Extracted, g. p. cb.m.	..	..	..	..	5·30	7·65	144
Extracted, per cent.	..	..	..	..	98·0	58·2	..

sulphuretted hydrogen eliminated, based on ammonia extracted. It must be remembered that, theoretically, per 100 parts of ammonia only 100 parts of sulphuretted hydrogen should be eliminated.

The tests on April 10, June 29, July 19 and 20 were made to demonstrate that the extraction of ammonia and of sulphuretted hydrogen is complete even when the solution of the metallic salt is nearly completely saturated. Even at so low a percentage as 0·14 per cent. of ferrous sulphate, the absorption of both compounds NH_3 and H_2S was a good one.

From the tables it will further be seen that the extraction of ammonia is complete even at a temperature of 35° C. It will be equally complete at 50° C., and even above.

The diagram shows a complete plant for this process. The washing liquor is pumped by pumps A from the tank B to the washer C, in which all the ammonia and a corresponding part of the sulphuretted hydrogen are absorbed. The washer used is one of Feld's centrifugal washers. The liquor leaving the washer passes through the still D, and is collected in the tank E, which is the regenerator. In both appliances the liquor meets with sulphur dioxide and air coming from the sulphur-oven F and from the air-pump G. By the action of sulphur dioxide and air, the sulphide of iron formed in the washer is decomposed and the iron salt regenerated. By an overflow the liquor runs from the tank E to the tank B, whence it is continuously pumped upon the washer. By the continued alternative action of crude gas and sulphur dioxide upon the liquor, ammonia sulphate and free sulphur are formed.

The washing and regenerative process may continuously go on, without any control, except the testing of the strength of the liquor, which may be done every ten or twelve hours. Even if this control should not be attended to, there is no chance of ammonia escaping, as the absorbing power of the liquor, which is continuously regenerated in the tank E, is not diminished, as explained by the tables. As soon as the liquor contains 30 to 45 per cent. of ammonia sulphate and a corresponding amount of sulphur (which may be the case after ten or twenty hours, according to the quantity of liquor in circulation), the liquor is pumped from the tank E to one of the tanks H. Meanwhile, tank B is filled with fresh liquor.

The tanks H serve the purpose of complete oxidation of the salts in the liquor into sulphates. By this oxidation the sulphur is precipitated, and is then separated from the liquor and washed in the filter-press I. Part or all of the sulphur is burnt in the sulphur-oven F by air coming from the air-pump G. The sulphur dioxide thus formed and air are used for the regeneration and oxidation of the liquid in the tanks E and H, as above stated.

The liquor coming from I and containing sulphate of ammonia and sulphate of iron is collected in the tank J and continuously pumped by the pump K into the lowest or finishing chamber of the washer C. The object of this is to precipitate the iron completely from the ammonia sulphate solution. For this purpose, the liquor runs for about six to ten hours continuously through the finishing chamber of the washer; no control being necessary. It does not interfere with the completeness of the process if the liquor runs even some hours longer through this chamber than required. After the liquor is completely decomposed, it consists of a small quantity of iron sulphide mud and a concentrated solution of ammonia sulphate. The liquor is now pumped to the tank L, where it is cleared by standing for some hours. After the liquor is nearly clear, it is filtered by the filter-press M and collected in the tank N. Only one filtration every twelve hours is necessary. The iron sulphide mud in the tank L and from the filter-press M, which contains some ammonia sulphate solution, is (without being washed) run to the regenerator E, where it is mixed with fresh water or virgin liquor, and used again for feeding the washer C after being treated with sulphur dioxide.

The clear sulphate of ammonia solution in the tank N, containing about 30 to 45 per cent., is concentrated and crystallized in the vacuum boiler O. The crystals are separated from the mother liquor in the centrifugal apparatus P.

TABLE B.—*Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Iron Salt.*

[1 cubic metre = 35·3 cubic feet.]

—	Liquor.		Gas.				
	Fe S O_4 $7H_2O$	Fe S O_4 $7H_2O$ Decomposed.	Quantity per 24 Hours	Temperature.	Ammonia. Grs.	Sulphur. Grs.	Sulphur on NH_3 Absorbed.
	Per Cent.	Per Cent.		Deg.	Per cb.m.	Per cb.m.	Per Cent.
June 29, 1909.							
(*a*) Beginning of 1st hour							
Inlet of washer	13·9	..	1875	..	3·97	11·3	..
Outlet of washer	..	..	..	..	0·04	6·04	..
Extracted g. p. cb.m.	..	..	..	..	3·93	5·26	134
Extracted, per cent.	..	..	..	..	99·0	46·5	..
(*b*) After 2 hours—							
Inlet of washer	..	..	..	..	4·50	10·9	..
Outlet of washer	..	..	..	..	0·07	5·8	..
Extracted, g. p. cb.m.	..	..	..	..	4·43	6·1	138
Extracted, per cent.	..	..	..	..	98·0	51·0	..
(*c*) After 4 hours—							
Inlet of washer	6 5	45	..	..	4·5	10·5	..
Outlet of washer	..	..	..	..	0·07	4·7	..
Extracted, g. p. cb.m.	..	..	..	..	4·43	5·8	139
Extracted, per cent.	..	..	..	..	98·0	55·0	..
(*d*) After 8 hours—							
Inlet of washer	..	98	..	..	1·8	9·6	..
Outlet of washer	..	..	..	..	0·04	5·7	..
Extracted, g. p. cb.m.	..	..	..	..	1·76	3·9	220
Extracted, per cent.	..	..	..	..	97·7	40·0	..
July 17, 1909.							
With fresh absorbing liquor							
(*a*) Beginning of 1st hour	13·9	..	1620	29	..	..	..
(*b*) After 2 hours	11·74	15·5	..	..	..	..	..
(*c*) After 3 hours—							
Inlet of washer	..	..	..	..	5·36	12·86	..
Outlet of washer	..	..	..	..	0·117	5·58	..
Extracted, g. p. cb.m.	..	..	..	..	5·243	7·28	138
Extracted, per cent.	..	..	..	..	98·0	56·6	..
(*d*) After 8 hours	1·6	88·4	..	..	..	..	..
(*e*) After 8½ hours	0·14	99	..	..	0·06	..	..
July 20, 1909.							
With regenerated liquor.							
(*a*) After ½ hour—							
Inlet of washer	..	..	1080	25	4·76	12·83	..
Outlet of washer	..	..	..	..	0·02	6·99	..
Extracted, g. p. cb.m.	..	..	..	..	4·74	5·84	123
Extracted, per cent.	..	..	..	..	99·6	48·5	..
(*b*) After 3 hours—							
Outlet of washer	..	..	..	..	0·0056	..	..
(*c*) After 6 hours—							
Outlet of washer	..	..	..	..	0·0085	..	..
(*d*) After 8½ hours—							
Outlet of washer	0·14	99	2160	..	0·0056	..	..

The gas to be treated by the process should pass a tar-washer and a Pelouze apparatus to produce pure ammonia salt. Any cyanide extracted with the ammonia is precipitated with the sulphur in the oxidation tank, filtered with the sulphur, and burnt with it.

The liquor used for the extraction of ammonia and sulphuretted hydrogen is regenerated with practically no loss. If there is more sulphuretted hydrogen in the gas than is equivalent to the ammonia, a surplus of sulphur is recovered. This may be sold. If there is less, sulphur from any other source may be used in the sulphur-oven. Also other gases, containing sulphur dioxide, may be used for the regeneration of the iron solution from the iron sulphide.

The process offers the following advantages for gas, coke, and producer plants.

A.—Ammonia.

1. The extraction of ammonia is equally good in summer and winter.
2. The ammonia is obtained in the form of a concentrated solution of ammonia sulphate.
3. No fresh water is required for the extraction of ammonia.
4. Any liquors resulting from premature condensation are completely absorbed in the new process.
5. The distillation of ammonia liquor is avoided.
6. No sulphuric acid is used for the absorption of ammonia. The sulphur equivalent to the ammonia is oxidized in the washing process.

B.—Sulphuretted Hydrogen.

7. From 60 to 80 per cent. of the total sulphuretted hydrogen is simultaneously extracted with the ammonia.
8. The only reagent consumed for the oxidation of sulphuretted hydrogen into sulphuric acid in this process is atmospheric oxygen, but none of this air is introduced into the gas.
9. So much of the sulphuretted hydrogen as is equivalent to the ammonia in the gas is recovered in the form of ammonia sulphate—that is to say, one part by weight of sulphuretted hydrogen for each part of ammonia present in the gas.
10. After the first washing liquors—*i.e.*, iron or zinc salts—have been formed, no chemicals whatever are required; the material for oxidation and extraction being used over and over again. The mechanical loss of material is insignificant.
11. By the simultaneous extraction of ammonia and sulphur, the purifiers are relieved to the extent of about two-thirds.
12. The process may be extended, with some modifications, to the complete extraction of the sulphuretted hydrogen.

C.—Apparatus.

13. The complete plant for ammonia and sulphuretted hydrogen extraction consists of a gas-washer, regenerating, oxidizing, and evaporating plant, centrifugal apparatus, sulphur-oven, two filter-presses, pumps, tanks, and accessories.
14. The plant may be erected in any ordinary building—not much space being necessary.
15. If a larger amount of sulphuretted hydrogen is to be extracted than corresponds to the ammonia in the gas, two more washers and certain accessories will have to be added.
16. The consumption of power and steam is low. The heat regenerated by the oxidation of the sulphuretted hydrogen into sulphur dioxide and sulphuric acid is used for the evaporation of the liquor of premature condensation.
17. The whole plant is simple. The efficiency of the apparatus is independent of the workman's skill, and is always uniformly complete.

Water-Hammer in Steam-Pipes.

The Manchester Steam Users' Association have issued a memorandum by their Chief Engineer (Mr. C. E. Stromeyer), in which he gives a detailed investigation of more than a hundred Board of Trade reports dealing with cases of water-hammer in steam-pipes. As the result of his inquiry, he comes to the conclusion that safety from water-hammer can be assured by placing the junction-valve of a single boiler at the highest point of the steam-pipe range, and leading a horizontal pipe, or an inverted L-pipe, to the engine, so that under no condition can water lodge in a horizontal or slightly slanting pipe over either the engine or the boiler junction-valve. If a horizontal steam-pipe rises after it leaves the junction-valve, or if the pipe falls and then continues in a horizontal or slightly inclined direction, or if any portion of the pipe bends upwards at both ends, then accumulation of water may bring about water-hammer when steam is admitted above the water surface in a partially filled pipe or under the enclosed water. Water-hammer can be produced in pockets by the slow condensation of steam; or if a plug of water lying in a pocket is set in motion, serious harm may be done at distant parts of the steam-range. To prevent this water-hammer, all the pockets should be provided with water-catches having gauge glasses and automatic drains. Drains on steam-pipes have been the cause of about one-fifth of all water-hammer. If kept partly open, they are likely to choke; if used occasionally, they either let out the water and disturb the surface, or they are inoperative and do not remove the water as expected. Mr. Stromeyer concludes that no rules can be formulated for complicated pipe arrangements,

NEW TAR EXTRACTING APPLIANCES.

Professor F. W. Burstall's Patents.

A visit to the magnificently equipped University at Edgbaston, Birmingham, which would under any circumstances prove interesting, is at present exceptionally so to anyone engaged in the gas industry, owing to some novel apparatus that is to be seen in conjunction with the Mond gas producing plant installed in connection with the power-house there. This power-house, it may be remarked, is fitted with engines of as many types and patterns as possible, for the benefit of the students. Down one side all the steam-plant is ranged; and on the other there are a large "Premier" gas-engine, an American Westinghouse gas-engine, three petrol-gas engines, and a Diesel oil-engine. Altogether the plant must represent a good many hundred horse power; and from this portion of the University all the current, gas, and steam required are at present supplied. So far, there is no coal gas used; but a supply is contemplated from the Corporation mains, and then there will be on the premises producer gas, coal gas, and acetylene. The latter is employed for lighting only when the electricity plant is shut down. Over this portion of the University, Professor F. W. Burstall presides; and he has under him now 165 students in the Engineering Department, which is practically the full complement—almost all of them taking the four years' course which is necessary for securing their degree. Hitherto the Professor has not given any special attention to the training of men for gas-works; but this is a matter which he is of opinion will undoubtedly be taken in hand in due time.

It was amid the fascinating surroundings of the power-house that Professor Burstall was recently discovered by a representative of the "Journal" who was intent on seeing for himself just how much was being done there in the direction of extracting tar from producer gas, and the methods by which this desirable end is being secured. A hint that a battle against tar particles was being waged at Birmingham was given in the "Journal" in May last, when, in the issues for the 11th and 18th, there appeared abstracts of two patent specifications in the name of Professor Burstall. The first of these was for a gas-washer, for freeing gas from tar or dust and cooling the gas; while the second related to a centrifugal pump for the extraction of tar or dust from gases. Both abstracts were illustrated; and in view of the recent date of their publication, readers may be referred to them for a detailed description of the inventions.

The Tar-Extractor.

It is, however, mainly with the apparatus protected by the last-named patent taken out by Professor Burstall that the present article has to do. To use the inventor's own words, "this appliance is for the extraction of tar or other liquid matters from gases; and it has proved itself capable of completely removing tar from large volumes of gas. The tar-extractor consists of a casing, so arranged that the gas enters near the centre and leaves near the outside. In this casing, there rotates a shaft upon which are fastened radially a large number of steel wires. The speed of the wires is very high—nearly 10,000 feet per minute at the tips. Any small particles of tar that are carried in with the gas are, during their passage through the extractor, brought into contact with one of the wires which is already covered with a thin tar-film. The surface tension of tar being high, the tar adheres to the wires until the thickness of the film becomes great enough for the centrifugal force to throw the tar against the casing, from which it is removed by a suitable opening. It is advisable to inject a small quantity of water to assist in cleaning the wires; but the extractor can be worked dry if desirable."

The apparatus, it may be explained, originated in a curious way. When Professor Burstall started the gas-engine researches with which his name has since become so prominently connected, he discovered that the producer-gas plants were not, in fact, quite all that they were represented to be. They allowed plenty of tar to pass right through; and, as a consequence, he found himself in difficulties from the particles of this substance which had not been removed before the gas was taken to the engines. Therefore he was under the necessity of setting to work to see what means could be devised for the efficient cleaning of the large amount of gas that he required. There not being any storage at disposal, it was essential that the gas should be cleaned as it was made. Once more has "necessity" proved to be "the mother of invention;" for the urgent need of overcoming the tar trouble has resulted in the evolution of the ingenious, and at the same time extremely effective, extractor to which reference is now being made. The principle on which Professor Burstall has worked is, so far as he is able to ascertain, a novel one. At any rate, no objection has been raised by the Patent Office authorities as a result of their fifty years' search. Nothing at all like it has been found. The leading feature of the extractor is its small bulk in proportion to the amount of gas cleaned; a 24-inch wire rotor, running at 1800 revolutions per minute, being sufficient to clean 30,000 cubic feet per hour, and taking about 5-horse power. The gas, whether from a retort or a producer, is first cooled and the major portion of the tar removed. The gas then contains only very finely divided tar, which will not readily deposit; and the tar-extractor was designed to remove this fine tar by making it meet during its passage through the extractor steel wires rotating at a high speed. The wires are fixed to a ring; there being some 48 wires per ring, and the depth about a foot.

The idea of the working, as explained to the writer, and supplementing the operations described in the second paragraph, is that the gas enters in the centre of the apparatus, and has to work its way to the edge. In doing so, it is compelled to pass among a multitude of wires revolving at a high speed. It may be assumed that the tar passes through the apparatus in very finely divided particles—say, small spheres of perhaps 1-10,000th of an inch in diameter. Now, with particles so finely divided as this, the action of gravity is comparatively small—as is instanced by the manner in which dust remains suspended in the atmosphere. Tar, also, has a very high surface-tension—that is to say, if two tar globules can be forced into contact, they cannot be got apart again. The chances are, owing to the position relative to each other in

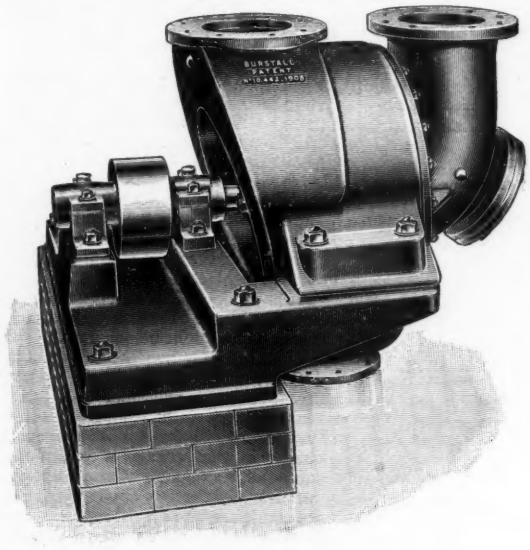


Fig. 1.—The Burstall Tar-Extractor.

which the wires are placed, that in passing through the fan every one of these finely divided particles of tar will strike one of the wires, which has already on it a thin film of tar. The two coalesce, and thus the tar slowly builds itself up until its thickness on the wire becomes sufficient for the centrifugal force to throw it off against the walls, whence it can be easily removed by simply washing. A point that cannot be too much emphasized is that the extractor is only designed to arrest the finely divided tar. It is intended that the heavy tars shall be washed out before the gas begins to be treated by this arrangement.

There is nothing in the extractor that is likely to get out of order. In fact, the one in use at the Birmingham University,

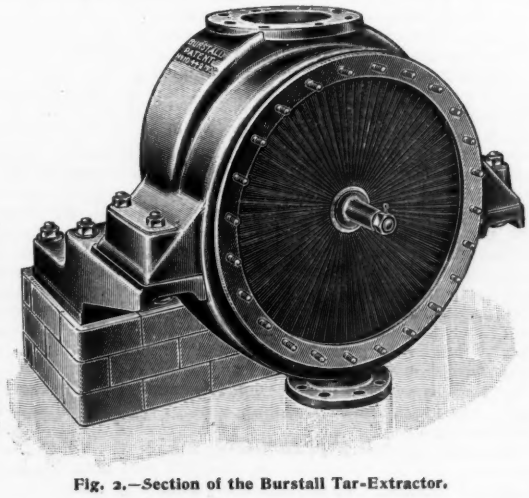


Fig. 2.—Section of the Burstall Tar-Extractor.

which is capable of passing 30,000 cubic feet of gas per hour, and is 19 inches in diameter, was put to work in December, 1907, and has since then been in operation daily from eight in the morning until six o'clock in the evening, without any renewals whatever being required. During the hours named, the whole of the make of gas is passed through the apparatus. As to its efficacy, ocular demonstration of this is amply provided by means of a comparison between streams of gas flowing from an open pipe before and after passing through the extractor. The tarry residue which falls from the apparatus is of a lightish brown colour, because the tar and the water which trickles through with it (in order to wash the tar from the apparatus down to the collecting vessel) are beaten up into an emulsion. In this condition it will remain for days. But on warming, it is found that the substance contains about 30 per cent. of moisture. While the extractor is in use, the gas does not pass at all through the sawdust scrubbers, which are otherwise a necessary adjunct to producer gas plants. Standing by the extractor for ten minutes, while about 5000 cubic feet of gas passed through it, the tar collected was seen to be quite an appreciable quantity—perhaps there was a pint of the brown emulsion in all.

The whole of this tar is a tar which is not deposited when the temperature is brought to atmosphere. It is too fine for that. And here is the key to some of the trouble that is experienced with engines working on producer gas, because normally all this tar goes into the engine. Of course, the percentage by weight is very minute; but it is quite sufficient to be highly objectionable if it gets into the pipes. Professor Burstall has not yet made a complete investigation into the character of this tar, but regards it as very deficient in valuable products. For example, he does not

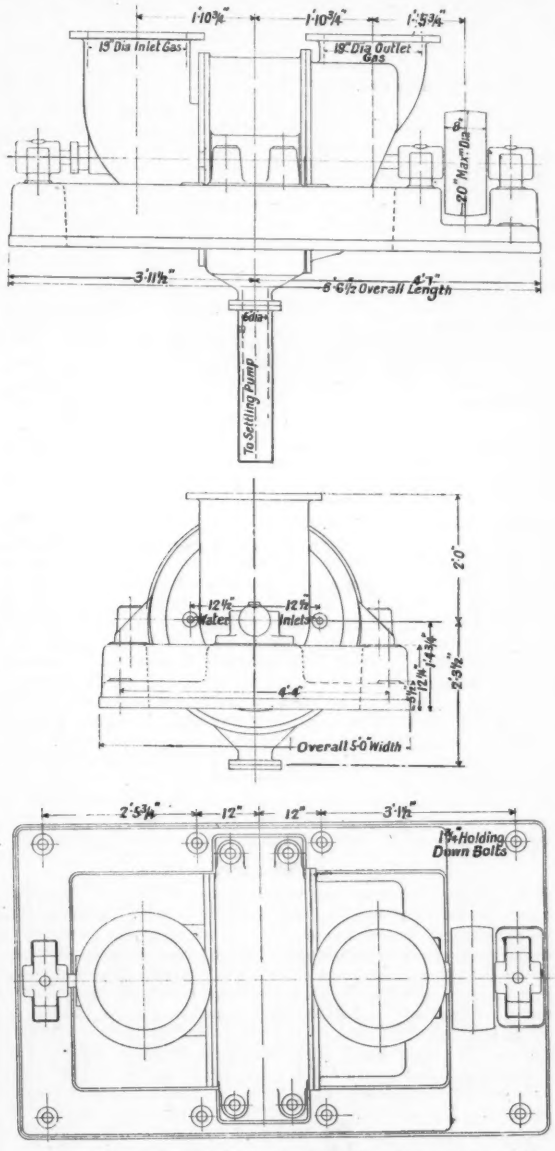
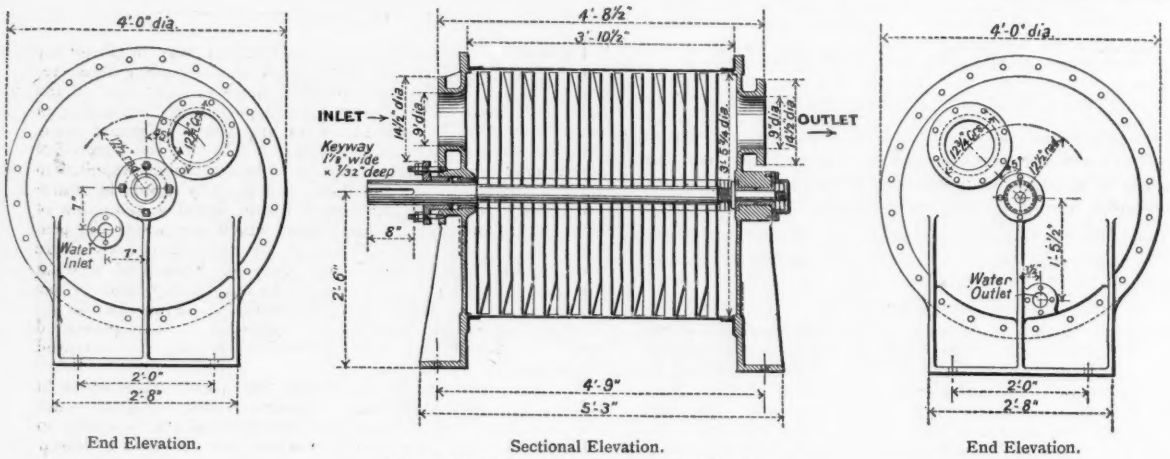


Fig. 3.—Burstall's 36-inch Tar-Extracting Fan, to Deal with 130,000 Cubic Feet of Gas per Hour.

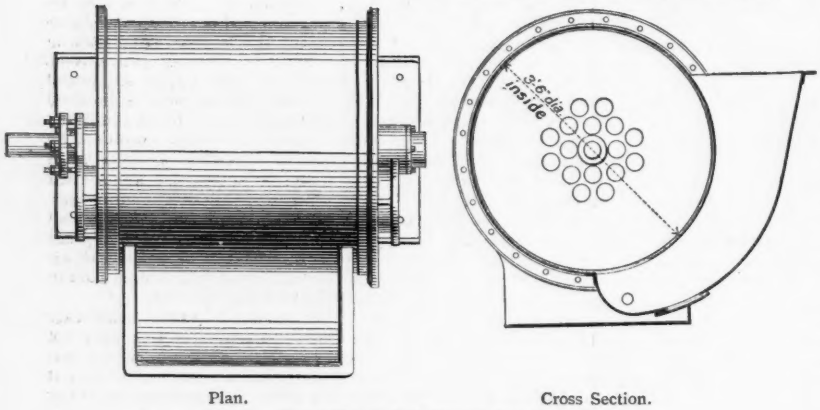
think there is any anthracene in it. He would not like to say definitely that this particular kind of tar is actually present in gas-works. In the course of the interview, the Professor produced a sample of jet black tar which had set nicely in a jar. This, he explained, had been through a sawdust scrubber and the usual cooling devices of a producer gas plant, and had travelled a considerable distance in the main. On distillation, it yielded merely an oil—one of the paraffin series—and pitch. One of these extractors was put down in connection with a coke-oven process; but it turned out that there was no tar worth mentioning to remove, so the extractor proceeded to extract oil from the gas—a light thin oil of the paraffin series. The tar had come down beforehand. This may be quoted as evidence that the extractor will take a liquid out if there happens to be one present.

Take for example a tar-extractor for 60,000 cubic feet of gas per hour. The wire brush for this is 30 inches diameter and 20 inches long. Butted wires are used, which are in this case of No. 12



End Elevation. Sectional Elevation. End Elevation.

Fig. 4.—Burstall's 42-Inch Rotary Gas-Washer.



Plan. Cross Section.

Fig. 5.—Burstall's 42-Inch Rotary Gas-Washer.

gauge; and these are drawn down, fitted into the ring, and then riveted over at the back. The steel rings in which the wires are thus fixed are mounted one after another on to a shaft, and held in position by nuts at the end. In small sizes, the wires are cast into the rings; but for bigger plants this is impracticable, because the solder into which they would be cast would not be mechanically strong enough for the work. The actual number of wires that will be included in a 30-inch extractor is 2400; and the material of which they are made is 3 per cent. nickel steel. The expense of this is not much greater than would be that of ordinary steel; and its use does away with risk of any kind.

The small amount of space occupied by the apparatus will be gathered from fig. 3, which illustrates (with dimensions) a 36-inch extractor, designed to deal with 130,000 cubic feet of gas per hour.

The Washer.

Now to come to the washer which is the subject of the other patent referred to at the beginning of this article. This consists of a cylindrical vessel in which are contained a number of discs, so perforated with holes in different positions—in one case near the centre, and in the next near the outside edge—that the gas is made to alternately pass from the centre to the circumference. These discs rotate in water; and as the tar collects on them, it is washed off, and re-appears in the catch-box attached to the vessel, from which it is removed as is required. The plates or discs are bent at the edge so as to throw the water round, because the action of the washer really depends upon a water-seal. No attempt whatever is made to get a close fit between the plates and the enclosing cylinder. The object of the machine is to collect the grosser tars and the dust. The finer particles of tar go through, as can be seen by the colour of the gas—and this in spite of the gas being quite cooled by its passage through the washer. Professor Burstall separates the tar into two groups, roughly—that which comes down when the gas is cooled, and that which does not so come down, but has to be removed either by straining or by some mechanical action. It is the second tar, in his opinion, that gives the trouble in the mains, &c., as it will travel some distance, and then settle in the valves of a gas-engine or in the small pipes of a gas-works. The washer now in action at Birmingham is an experimental one, 20 inches in diameter, and passing about 4000 cubic feet per hour. The tar removed by this is quite black, and full of dust; its appearance being different from that from the extractor, because there is no beating action.

Figs. 4 and 5 illustrate a 42-inch rotary gas-washer, according to the arrangement described.

Proposals for Using the Apparatus in Gas-Works.

Professor Burstall explained that, if he were putting an installation of his plant in a gas-works, he would have two of these washers—one running behind the other; and in them he would do his cleaning, cooling, and ammonia concentrating. Then from there he would pass the gas to two of the tar-extractors, also in series—one running behind the other. The object of having two of the extractors would be so that the second one should remove the minutest trace of tar, which it was unnecessary to remove from producer gas intended for engine work. The extractor, in addition to its tar-removing properties, being in the form of a fan, of course, acts as a "booster," putting up the pressure of the gas about 1½ inches between the inlet and the outlet. In gas-works practice, therefore, Professor Burstall is proposing to do away with the exhauster, besides the ordinary wet purifying plant, and to draw the gas through his extractor.

Another very interesting suggestion for gas-works use made by Professor Burstall was that a number of these extractors could be put one after another, and each kept at a different temperature. That is to say, there might be placed right close up to the hydraulic main an extractor with a comparatively small number of big wires in it; and this could be kept warm by covering it with an asbestos jacket. This would pick out the particular tar which happened to be soluble at that temperature. Then the gas might be passed along to another extractor kept at a different temperature, which, in its turn, would remove its own particular portion of the tar. Four or five of the extractors used in this manner one after another might effect a fractionation which is not at present secured.

While on the subject of gas-works practice, note may be made with satisfaction of the fact that Professor Burstall intends ultimately to tackle the question of the removal of the sulphur compounds from gas by washing; but as yet he has had his hands too full of other matters to give attention to this. He would like to see his way to reduce the size of the purifiers—to see if he could not take out at any rate the greater proportion of the sulphuretted hydrogen and other sulphur compounds by means of something less expensive than the present system.

An important fact to be noted in regard to both appliances is that, not only do they take up remarkably little space—quite infinitesimal as compared with the gas-works plant which they would displace—but, except for the bearings, the workmanship need not be of the best quality, so that they are very cheap things to make. What the Professor regards as absolutely essential in plant to accomplish wet purification, he claims to have attained—namely, that every particle of gas and tar shall be forced into contact with the wetted surface.

Needless to say, the Engineering Department of the Birmingham University is provided with a fully equipped laboratory; and there is to be seen here, among other things, a burner which is used, with producer gas, for heating vessels, &c. This burner consists of a piece of 1-inch pipe provided with nine slits in the uppermost portion. These slits are ⅛ inch wide; and they are situated with a distance between each of ¼ inch. There is no air admixture prior to ignition. More trouble, it may be remarked, is experienced in burning these weak gases than is often thought to be the case, because it is so easy to get incomplete combustion.

In thus reproducing the result of a lengthy chat with Professor Burstall and of a personal inspection of the plant at Birmingham University, the hope may be expressed that the article will prove as interesting to readers as did the conversation and demonstration to the writer. The extractor is doing all that is claimed for it on producer gas at the University; and particulars as to the results of its use on a retort-gas works, when available, will without doubt receive careful attention at the hands of gas engineers.

OFFICIAL TESTING OF GAS-METERS.

By Frederick Coe, of Nottingham.

From the commencement when the Sale of Gas Act, 1859, for the regulation of gas measures was put into operation, it has been considered as an imperfect measure by sellers of gas, administering authorities, and manufacturers of meters. Even inspectors of gas-meters, who are appointed to finally determine the registering state of meters submitted to them, are not agreed. Generally speaking, buyers of gas are not competent to criticize the technicalities of meter construction and gas measurement.

It is of general importance to all parties concerned that official inspectors of gas-meters should follow an adequate and uniform practice more in accordance with the whole spirit of the law regarding accuracy in the testing and stamping of meters. Such consideration would certainly call for the co-operation of gas-meter manufacturers and the administering authorities, and may-be an amended Act would be necessary. The object of the following remarks is to show, mainly from the point of view of an inspector of gas-meters, what the law imposes on inspectors. It is a remarkable fact that the greater number of inspectors follow an inadequate practice believed to be based on section 13 of the Act, and pay little regard to the equally important provisions contained in sections 11 and 12.

Experience has shown that, in many instances, the fees are not sufficient to cover the cost of ensuring accuracy of registration. The Act, as originally framed (in 1859), was an equitable measure, inasmuch as its adoption was of a compulsory nature; whereas the Act of 1860 when put into operation compelled only certain authorities to administer it, while the facilities afforded thereby were for the trading benefit of the whole gas industry, which has since become largely municipal. Official testing and stamping of meters, their manufacture, and repair, under such circumstances, are concentrated; and the inspectors appointed are comparatively few. In some instances, difficulty has in consequence arisen in dealing with the increased number of meters submitted; while the Courts have refused to receive official certificates in evidence regarding the correctness of meters that had not been tested personally by a duly-appointed inspector of gas-meters. Such personal testing of so many meters has never been really practicable. It would be more in accordance with practice were meters admitted as legal measures when they had been tested and stamped under the supervision or direction of duly appointed inspectors.

The cost of official testing and stamping of gas-meters is chargeable to the district of authorities administering the Act; and any necessary provision for the due ascertaining of the correctness or incorrectness of meters submitted, is of their responsibility. But the stamping of only such meters as had been duly tested and found to be incapable (by any means which are practically prevented in good meters) of registering incorrectly, is the responsibility of the inspectors to whom meters are submitted, under a penalty for each offence otherwise.

It is argued that all meters are not subjected to official regulation as are gas-meters. On the other hand, it has been suggested that all meters should be, as gas-meters are, subject to official regulation. Whatever value such arguments and suggestions may have, inspectors still remain liable as regards the stamping of inaccurate gas-meters. Whether all gas-meters are subject to official regulation as is provided for by section 17 of the Act, and that inspectors should seize all unstamped meters (when submitted in dispute even), is questionable, because, by a later Act (Gas-Works Clauses Amendment Act, 1871, section 13), sellers of gas thereby appear empowered to approve meters for the purposes of selling gas, provided the Sale of Gas Act's provisions have not been put into operation in the district. However, the meter's register is held as evidence of the amount passed through it (Gas-Works Clauses Amendment Act, 1871, section 20), and whenever the register of a meter is questioned, no matter if officially approved and stamped, or approved by a seller of gas and unstamped, the Sale of Gas Act is the undoubted authority regarding the accuracy of the register; and inspectors of gas-meters are the officials to finally determine the correctness or incorrectness of registration. The law does not distinguish between testing the accuracy of disputed registration and undisputed registration, although special care is observed with the testing of a meter in dispute as regards index registration. Indices are surely contrivances to register within the meaning of the law. They are certainly regarded as such in practice.

So far as incorrect registration by means of wrong indices and incorrect gear applies, it has hitherto been held with good argument that the errors found would not warrant the extra cost of detecting them. However accurate this statement may once have been, not at any time have all meters been so tested. The real extent of the errors through wrong and inaccurate indices, or wrong transmitting gear in meters, can never have been known. Such errors, when found, have been shown to be most serious, and some have remained for a number of years undetected.

The President of the Board of Trade seemed to have been so satisfied with the Act's provisions regarding index-testing that he was enabled to declare that, notwithstanding the absence of specified methods as to how to do it, the law provided for correct registration in meters within certain limits. (*Vide* "Journal," April 3, 1906). It would therefore be presumptuous if inspectors, in the absence of Board of Trade regulations, were to place any other construction on the Act's provisions regarding their responsibility. The sparsely specified methods contained in the Act's provisions, to be observed by inspectors in the testing of meters under the Act, permits of an inspector's judgment being exercised as to what method he may employ for the purpose of ascertaining the correctness of a meter before being compelled to stamp it and render himself liable to a penalty should he stamp it without first having duly tested it and found it incapable of registering incorrectly by any means which are practically prevented in a good meter. Whether the methods employed are questionable or not, should any party be dissatisfied with an inspector's decision, he is obliged to state the reason of his decision in writing to the party dissatisfied, if required to do so. In other words, the Act has not appeared to have presumed finality as regards the means by which gas may be measured commercially.

The real consideration of testing the actual registration in meters has, undoubtedly, been a question of cost. Inspectors are therefore compelled by their responsibility and their liability to seriously face this question of cost which compels them to stamp meters without duly testing them. There is no real need to incur a cost that could be considered prohibitive. By a simple re-arrangement in the manufacture of new indices, the correctness of the index and the transmitting gear, as affecting registration in a meter at the time of stamping, could be officially guaranteed, and this with the usual dispatch, and with meters submitted finished as heretofore—providing their indices were submitted previously for examination and stamping, so as to be identified in finished meters. Such indices could be readily examined by hand, and stamped for an extra fee not exceeding 3d. each index—probably 2d. each where the complete action did not exceed 100,000 cubic feet. To require this with all new meters submitted would not disorganize the present system of business, and would not cost more than a small additional fee. Certainly not a fee that could be considered prohibitive. This would call for co-operation by manufacturers of meters and authorities administering the Act, but not necessarily an amended Act.

There are, however, various other means by which inaccurate registration does result that the usual method of testing does not discover, other than by inaccurate or wrong indices or wrong gear in meters. Meters are stamped as registering correctly at fixed rates of working; and they may be seriously inaccurate at other rates of working and vary in registration as much as 20 per cent. By applying the provisions contained in section 12 of the Act, the stamping of such meters would be prevented, because there are good meters with means that prevent inaccurate registration at various rates of working. But owing to the provisions of section 13, fixing the rate at which meters shall be tested for percentage of error, such inaccurate registration, in dry meters, can only be officially prevented by a working arrangement between inspectors and senders of meters.

With certain wet meters, extended water-ranges may result in inaccurate registration when the meters are worked at the exceedingly high rates which extended water-ranges are provided to permit. It then becomes questionable if such meters should be stamped, unless they had been subjected to testing at low-water line and found to be incapable of registering incorrectly by abstraction of water, notwithstanding that they were compensators, because were all such meters found to be incapable of registering incorrectly by abstraction of water, incorrect registration at exceedingly high rates of working would not result, but in many instances their capacity per hour would be limited to little more than their badged amount.

Were all wet compensating meters required to pass an increased speed-test at normal water-line, the low water-line test might be omitted, because loss of water is provided against in some meters by compensation, and incorrect registration through loss of water is prevented in others. This is of serious consideration to inspectors of gas-meters, sellers of gas, and buyers of gas, because wet compensating meters may register either very fast or else pass unregistered gas to a considerable extent at increased rates of working, even though registration is correct at the prescribed normal rates, and even until the float falls and the supply is closed by abstraction of water.

There is provision against the using of meters at rates beyond their badged amounts per hour; but it is not really acted up to. It is admitted that meters are fixed to pass any amount, from a small pilot light up to as much as can be got through them.

With meters of large capacity per hour, inspectors have perforce to test them at rates much below their badged amounts, and maybe that, when in use and working at their normal rates, registration (with dry meters) would be seriously incorrect. With good meters this would not be the case. Inspectors should bear these facts in mind before stamping meters of large capacity per hour. What the registration state of meters would be at their normal rate per hour, and the pressure prescribed, may, in many instances, be ascertained by increasing the pressure until the normal rate per hour is attained. With meters the badged capacity per hour of which is not attainable by increasing the pressure, correctness of registration can be ascertained by comparative tests at rates lower than the badged capacity per hour. Dry meters that register comparatively correct at reduced rates, do not usually vary in registration at higher rates of working, and good meters will not do so beyond the limits for error permissible. These may well be matters of arrangement between

inspectors of gas-meters and the senders of meters, so long as the law holds as to the testing of meters for percentage of error at fixed rates.

Difference of pressure does not materially affect the register of meters at fixed rates of flow—probably not more than ½ per cent., while increase of pressure may not affect registration at different rates of flow. Although it has been admitted with the selling of gas at exceptionally high pressures that increase of pressure does not affect the register of a meter, registration may be affected at different rates due to increase of pressure. Registration may or may not vary when the internal resistance in a meter varies. The internal resistance in a meter will vary if the rate of flow through it is varied. Probably the greater number of gas-meters do not vary in registration at different rates of flow beyond the limits for error prescribed; while, maybe, very few would so register correctly were the limits of error reduced. Where it is considered that a reduction of the present permissible error is desirable, this would appear well worthy of consideration. Meters may register quite accurately at fixed rates of working, and yet be capable of registering considerably in error at other rates of working. Some are of opinion that the official testing of gas-meters at a pressure that will balance a column of water half-an-inch high is useless, unnecessary, and unreliable, in view of the fact that the service conditions are different from formerly. It must, however, be quite clear that meters approved under the prescribed pressure must needs be of good finish, work smoothly, and be of large thoroughfare. These are essential features in all good meters.

It is fairly generally believed, and considered as acted up to, that the law provides for the testing only of the measuring chambers of meters. To do this it is necessary that the tangents in dry meters, and the measuring wheels in wet meters, should be observed. In neither case has this ever been practicable with meters as submitted for verification. Inspectors have not demanded that such facilities shall be provided. Such facilities as those provided for the purpose of official verification, and which are generally held as sufficient, neither ensure the accuracy of the measuring-chambers, as compared with the markings per revolution, nor the correctness of the index registration, which the law holds to be the register. The markings required by law to be put on all meters submitted for official testing and stamping are minutely stated, and are recorded by inspectors in their minutes of testings; but they do not appeared to have answered any generally useful purpose in verification. They do, however, form the basis of the charge for verification; while the charges are not affected by any markings of less amounts than one cubic foot beyond the first cubic foot.

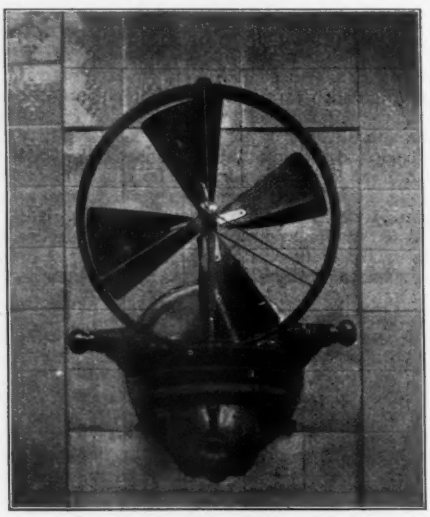
Sellers of gas are of opinion that sufficient attention has not been directed towards the passing of unregistered gas apart from slow registration. It is claimed, and it does appear rightly so, that serious losses result as a consequence (*vide* "JOURNAL" for July 9, 1907, p. 93). Certain it is that no satisfactory registration state can be ascertained with an unsound meter. Even were the small amount of ¼ cubic foot per hour to pass unregistered (the minimum amount prohibited by the Act), serious loss may result to the seller of gas. Registration would vary at different rates of working until, when working such an unsound meter at a rate of 2 cubic feet per hour (which is equal to the supply of a modern burner), the error would be not less than 20 per cent., although registration was correct at the normal rate of the meter. It might be said that, were it so, the gas unaccounted for would be enormous. But registration losses are not always against sellers of gas. It would thereby appear that one very largely balances the other; while buyers, as individuals, may gain or lose.

To observe that a meter registers the minimum amount prohibited by the Act to pass unregistered, and that it does so throughout one revolution of its measuring chambers, would in some instances seriously delay the work of a testing-station. The letter of the Act prescribes that meters found to work under the conditions prescribed shall be deemed sound meters. They may be so legally; but actually they may not. It is of much importance that meters should register the minimum prescribed throughout one revolution whenever that is practicable; and unless sufficient provision is made for dealing with large consignments of meters, considerable delay must arise in so dealing with all, or even a portion, of the meters that are submitted at many places. There are, however, means by which meters could be so tested with dispatch.

Were these various points seriously considered by inspectors, administering authorities, and manufacturers of meters, it might be that eventually some generally uniform and satisfactory system would be established.

BROCKWAY-PHILLIPS GAS VENTILATING FAN.

ON the occasion of the meeting of the Eastern Counties Gas Managers' Association last week, the members were afforded an opportunity of inspecting, in the show-rooms of the British Gaslight Company, a gas-driven ventilating fan designed by Mr. E. J. Brockway, of Cleethorpes, and manufactured by Messrs. Harper Phillips and Co., Limited, of Grimsby, who are the licensees for the sale of the appliance. The fan, which is shown in the accompanying illustration, is operated with ordinary gas, and it can be instantaneously connected with the service-pipe by means of a small flexible tube. The power is furnished by a completely enclosed bunsen burner; and the speed of the fan is regulated by a tap. It can be set at any desired angle—even at right angles to a wall—and be started at once. The fan will be found specially suitable for ventilating houses, hotels, billiard-rooms, workshops, bottling stores, and wherever free circulation of air is necessary. It is specially serviceable in preventing steaming on shop windows. It is claimed for the fan that it is free from smell, that no noise or danger attends its working, that it has no complicated mechanism, does not require attention, and will run for 24 hours at the cost of 1d., or about one-eighth the working cost of an electrical fan.



A Gas-Driven Ventilating Fan.

The history of the fan is rather interesting. It appears that the proprietor of a large local hotel, lighted throughout with gas, called upon Mr. Brockway some months ago and inquired if he could do anything to ventilate his smoke-room and billiard-room, as the electrical people had, he said, been worrying him to put in electrical fans. Mr. Brockway at once saw the danger of losing a good consumer; and having been recently experimenting with hot-air engines for a small power purpose, the idea struck him that this principle might be applied to fans. Experiments were made in his own shops, and found to be successful, with the result that the fan was patented in conjunction with Messrs. Phillips. Only a few have been made up to the present; but we are informed that they are giving complete satisfaction, and that an order has just been received, after trial, for the fitting up of a number, as shown in the illustration, in underground lavatories and for bottling stores.

THE "DARWIN" BURNER.

THE patents relating to the well-known "Darwin" inverted incandescent burner were purchased in the spring of this year by Messrs. Charles Joyner and Co., of Icknield Square, Birmingham, who have since then devoted a very large amount of time and thought to the remodelling of the burners, and claim now to be turning out a far superior article to anything that has been produced before. They have dispensed with the three-prong iron mantle-carrier, which they found tended to damage the mantles when being fitted, and are now supplying a high-class clay nozzle, with ears on, designed to carry the mantle. The protector plate is made of best tinned steel, and completely covers the brass parts exposed to the flame, thereby keeping the burner free from any deposit. Two novelties have been introduced this year—namely, the medium-size burner, No. 2, which is finding a very ready sale, and the No. 7, which is an enclosed burner in an enamelled iron casing.

The No. 2 "Darwin."

A test of a No. 3 burner, taking an ordinary sized mantle, showed that, with a consumption of 3·55 cubic feet of gas per hour, at a pressure of 15-10ths, the illuminating power was 122·76 candles, or 34·58 candles per foot. Another test of a No. 5 burner, taking a bijou mantle, gave, with a consumption of 1·25 cubic feet of gas per hour, at 17-10ths, 52-candle power, or 40 candles per foot.

The burners are made entirely in the firm's own works; and all parts are interchangeable, so that replacements can be readily made.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Autumn Meeting in Hull.

The Autumn Meeting of the Association was held at Hull last Thursday. Though the noted seaport is situated at the very northern extremity of the district, the members were attracted in considerable numbers, which must be attributed as much to the magnetic personality of the President (Mr. John Young) as to any other influence. The day's programme commenced with a luncheon at the Royal Station Hotel, on the invitation of the Chairman and Directors of the British Gaslight Company, whose Hull works are under the management of Mr. Young. Unfortunately, only one representative of the Board was able to be present—that was, General W. T. Corrie. But he was a worthy and genial representative of a Board who thoroughly recognize the value of technical organization in the gas industry; and his affability throughout the luncheon and subsequent proceedings effectually swept away any regrets that the members and visitors may have felt at not seeing other members of the directorate present whose names are as household words in the technical, commercial, and administrative departments of the gas industry's work. Supporting General Corrie were the Mayor of Hull (Mr. H. Feldman), the Sheriff (Dr. Gautby), Mr. C. F. Ruggles, the outgoing President of the Association; Mr. John Young, the incoming President; Mr. Thomas Glover, Ex-President of the Institution, and Engineer and Manager of the Norwich station of the British Gaslight Company; Mr. A. W. Brookes, the Secretary of the British Company; Mr. A. Allan, Assistant-Engineer at Hull; Mr. W. Lovatt, Chief Clerk; Mr. J. R. Warren, District Superintendent; Mr. G. Perkins, Show-Room Manager; Mr. J. J. Runton, the Chairman of the East Hull Gas Company; Mr. J. Holliday, Engineer and Manager of the East Hull Company; Mr. D. Wood, Secretary; Mr. C. B. Newton, the Corporation Gas and Water Engineer; Mr. E. Laverack, Town Clerk; Mr. A. E. White, City Engineer; Mr. H. Bell, Corporation Electrical Engineer. Other guests included the President of the Midland Association (Mr. W. Langford), Mr. W. H. Thrale, the Secretary and Manager of the Hessle Gas Company; and Herr Albert Schmidt, representative of Herr Feld.

Before luncheon was served,

General CORRIE remarked that he was present as one of the Directors of the British Gaslight Company; and he was sorry he was the only one who could conveniently be there. However, in the name of the Board, he welcomed the members to Hull, and to those who were not strangers, and were resident in Hull, he gave hearty welcome to the luncheon. Those connected with the Gas Company were all delighted to see their guests; and he hoped the visit would be a pleasant one. He felt sure it would be so; for his friend, Mr. Young, was so popular with everybody, including the Directors. In the name of the Chairman and Directors of the Company, he bid all a hearty welcome.

Mr. YOUNG (after luncheon) said he felt the members of the Association would feel there was some blame attaching to him if he omitted to take this opportunity of thanking his Worship the Mayor and the Sheriff for being present that day. When he (Mr. Young) took charge of the British Gaslight Company's works at Hull, his predecessor was in such a state of health that he was unable to do much in the way of introducing him; but he (Mr. Young) soon found that his predecessor's sterling qualities and fine business instincts had prepared the way for a kindly reception to his successor, and especially did he find this when he had to meet any of the city authorities. Every scheme that he had to advance, every business transaction, every negotiation there had been between the Corporation and themselves (and he thought he might speak here for the East Hull Gas Company, as well as for the British Company) had been considered with the greatest fairness by the business men in the governing body, and with a kindness and courtesy that no words of his could thoroughly and properly express. It was a great thing for a city to have men of fine business instinct who were willing to give up their time, ability, and energy to the good government of the city. Hull was particularly blessed in this regard. His Worship the Mayor had devoted many years to the service of the city, and for the last three years had occupied the principal and most honoured position the citizens could bestow upon him. The Sheriff (Dr. Gautby) was second to none in working for the city's progress. Unfortunately, there were a lot of people in Hull who were ever decrying their city, and saying that things were done better elsewhere. He (Mr. Young) went to school in Hull; he began business there; and so he knew something of the city, and had a warm heart for it. He would say to all those pessimistic people—take example by the civic rulers, especially his Worship the Mayor and the Sheriff. They never decried the city, but they gloried in its progress; and it was the duty of each one of the citizens to endeavour to enlarge and magnify it in the eyes of the nation. He ventured to give the toast of the Mayor and Sheriff.

The MAYOR, in his response, said it was a privilege to extend a cordial welcome to the gas experts of the eastern counties. They were gentlemen who practically advised as to the best methods whereby the consumer could be properly and adequately safeguarded, and obtain from gas the greatest efficiency. He was glad to learn that Mr. Young entertained such a good opinion of Hull. During the last few years the, Corporation had done all in their power to obtain the good opinion of visitors to Hull. In his view, the more advanced municipalities were the better for the people, and for the suppliers of such necessaries as gas, because the more a city or town was improved, the more essential became improved and additional gas lighting. Nothing to his mind was better in making a good impression than to have an adequate supply of gas—particularly on the terraces. In this connection, he took the opportunity of tendering a compliment to the British Company and the East Hull Company for their ready assistance and help in connection with a scheme for adequately lighting the terraces of the city. On every occasion that the Corporation had had to deal with the British Company, they had always been met in a fair and reasonable spirit. He took it that it was the policy of gas companies in a large city like Hull to work in harmony with the municipality. It was to their mutual advantage; and he did hope the good feeling that had existed so long would be continued, as he was sure it would be while the British Gas Company was so well managed as it was that day. He was delighted to meet General Corrie. He was a man who had had a wide experience, and had been engaged very largely in the defence of the honour of his country. Their Chairman knew how necessary, from his experience, it was to use tact and judgment not only in military matters, but in the management of concerns like the one with which he was now associated. He proposed General Corrie's health.

The SHERIFF, in his response to Mr. Young's toast, directed his remarks to the question of competition, which he thought had been of as much advantage to gas as it was to individuals. It helped to bring out the better side and the resources of people more than ease and monopolies.

General CORRIE, responding to the toast of his health, endorsed what had been said by his Worship the Mayor and the Sheriff as to the position and utility of the gas industry, which still made strides, though it had to meet the competition of the electric light. The gas industry would never sink simply because the electric light was useful.

Mr. RUGGLES said the members of the Association could not leave the festive board without passing a hearty vote of thanks to the Chairman and Directors of the British Gaslight Company for their kind hospitality. They had treated their visitors handsomely—not only by the luncheon itself, but by the way in which the representatives of the Company had rallied round them. Those present who were fortunate enough to attend the excursion of the Institution to Norwich in June would understand the way the Board of the British Gaslight Company regarded the members of the gas profession. They had had further evidence of this that day.

The words of the President were heartily endorsed.

General CORRIE said he thought it was a sort of "practical joke" getting him on his legs again, when he had been told by Mr. Young that there were to be no speeches, and when he was not such a speechmaker as other members of his Board, whose absence he particularly had reason to regret. However, on behalf of the Chairman and his other colleagues, he thanked the members for their vote, assuring them that the Board had always at heart the welfare of those who laboured in the gas industry.

Business Meeting.

The Business Meeting was shortly afterwards held in another room in the hotel. The retiring President (Mr. C. F. Ruggles, of Leighton Buzzard) occupied the chair at the opening of the proceedings.

The HON. SECRETARY (Mr. T. A. Guyatt, of Ely) read the minutes of the spring meeting held at Stamford; and they were confirmed.

ADDITIONS TO THE ROLL.

The following nominations for membership were submitted: Mr. Peter Mason, of Kibworth Beauchamp; Mr. William H. Archer, of Cromer; and Mr. John Andrews, of Langley Mill, Notts. As associate: Mr. T. N. Ritson, of London.

Mr. W. J. CARPENTER (Yarmouth) proposed that these gentlemen be elected; and he suggested that the new members who were managers of works should be prevailed upon to join the Commercial Sections.

Mr. G. R. CASTERTON (Melton Mowbray) seconded the motion, which was unanimously adopted.

DISTRICT MEMBER OF GAS INSTITUTION COUNCIL.

The PRESIDENT said he had much pleasure in proposing that Mr. John Young, their new President, should be appointed district member of the Council of the Gas Institution. Mr. Young had been on the Council for three years; and it would, he was sure, give him pleasure to continue in office another year.

Mr. F. PATERNOSTER seconded the motion; and it was unanimously carried.

THE NEW PRESIDENT AND THE OLD.

The PRESIDENT said the next item on the programme, the members would be delighted to know, was that of asking Mr. John Young to take the presidency of the Association during the ensuing twelve months. Mr. Young was so well known to the members—in fact, to the gas profession generally—that no words were needed from him by way of introduction. They were all pleased to have been able to secure the services of such an excellent man to fill the post of President; and he (Mr. Ruggles) was positive that, at the end of Mr. Young's year of office, each member would agree that he had benefited from his knowledge, experience, and ability. He had much pleasure in asking Mr. Young to take the chair.

Mr. YOUNG said his first duty was an exceedingly pleasant one; and it was to propose a hearty vote of thanks to the retiring President for his excellent services during his year of office. Mr. Ruggles had been the successor of many worthy men who had struggled hard at the inception of the Association for, and had carried it through to, the great measure of success it enjoyed that day; and he had been a most worthy successor. He had upheld

the traditions of the Association; and, under his able guidance, it had prospered exceedingly. He (the President) was only expressing the feelings of the members in proposing this vote.

Mr. J. Davis (Gravesend) said it gave him great pleasure to second the resolution. During the past twelve months, they had seen a great deal of Mr. Ruggles; and he was sure he was only expressing the views of the members generally when he said they had never had such a genial President before.

The motion was heartily carried.

The President's Medal.

The President remarked that it became doubly interesting to him, having heard the expression of the good feeling of the members towards Mr. Ruggles, to present to him the President's Medal of the Association. He trusted Mr. Ruggles would long be spared to wear it; and that every time he looked upon it, he would think of the respect and the affection that were entertained for him by all who knew him.

Mr. Ruggles, in reply, said that words failed him to express his gratitude for the handsome present that had been voted to him, and for the kind words that had been used concerning himself. He felt he did not deserve them. When he took the chair twelve months ago, he did so with fear and trembling; but he regretted now, after the many kindnesses he had received at the hands of the Committee and of the members generally, that his year of office had expired.

The President then delivered the following

INAUGURAL ADDRESS.

I must again thank you for the honourable position in which you have placed me, and assure you that I shall endeavour to carry out the duties of the office to the best of my ability. The members of the Association have always given such loyal support to their Presidents that I have every confidence that my shortcomings will be pardoned; and with your kindly assistance I hope my year of office will be one of continued progress.

An Injudicious Act.

We have now had an opportunity of judging the probable effects of the Eight Hours Act; and as coal is the main factor in our success, as it is also the foundation upon which rests the prosperity of all other industries, I make no apology for reviewing the situation from my point of view. The date of the introduction of the Eight Hours Bill was well chosen by the representatives of the Miners' Unions. The colliery owners, by united action, had raised the price of coal to a figure which could not possibly be maintained for any great length of time; and the men's representatives, being in a position to put pressure on the Government, seized the opportunity to induce the Home Secretary to introduce the Bill, hoping, no doubt, that it would become law at about the time when the owners' combination was sufficiently weakened to produce a falling price in the coal market. They could then very justly point out that the price of coal under the new Act was less than in the previous year, and no doubt hoped to claim that it had been beneficial to the community at large. Deputation after deputation waited upon the Home Secretary—deputations consisting of the ablest business men, representing every industry. They were received by the Home Secretary with the unfailing courtesy characteristic of him. He admitted that if the Act resulted in any permanent increase in the price of coal it would be a very serious matter for the country at large; but, with a smile of pity for the short-sightedness and selfishness of those who only looked at this question in so far as it affected (or appeared to them likely to affect) their own immediate interests, he gently hinted that all were mistaken—that the Act could not, and would not, affect any user of coal, except in a beneficial manner.

What are the actual facts? During May, June, and July the whole country was in an unsettled state, owing to the action of the colliers, on the Bill becoming law. Not satisfied with an Act defining the limit of the hours of labour, one section of the Miners' Union demanded a readjustment of the minimum wage. As a consequence of this, we were threatened with a general strike throughout the whole country; and trade, which appeared to be showing slight signs of revival, again became unsettled and depressed. Although, fortunately, a general strike was averted by the concessions of the owners (we do not hear of the men conceding anything), what is the effect of the Act on the collieries now working? We hear of reductions in the output of 10 to 16 per cent. per man. This must mean a permanent enhancement of the price of coal; and the cost of production of every article manufactured in this country must, therefore, be increased. Now, it is in the markets of the world that these goods have to compete in price with similar goods manufactured in countries under quite different conditions. Even before the introduction of the Bill, our manufacturers found it difficult to retain their trade; and if the cost of production is still further increased, how can they hope to hold their own? Any loss of trade by our manufacturers re-acts on the whole country; and we, as suppliers of artificial light, will suffer as they suffer. So that not only shall we have to pay an increased price for our raw material and all manufactured articles we purchase, but we are liable, also, to suffer a diminution in demand for our finished product, owing to the far-reaching and pernicious effects of this Act.

Bye-products Outlook.

The question of the price of coal naturally leads to a discussion of the probable future of our bye-products markets. Coke is at present our most important residual, and, in my opinion, the outlook is hopeful. It is true that the production of coke is increasing yearly; but the demand, so far, has easily kept pace with the production. In their own particular field, gas engineers are paying much more attention to the cultivation of a local coke trade—they are endeavouring to ascertain the requirements of their particular localities; and they are also educating the public to the advantages of using a smokeless fuel and in the method of attaining the best results from the fuel used.

The sulphate of ammonia market has kept fairly even during the last few years, and, in spite of the largely increasing production—not only from gas-works, but from coke-oven recovery plants, both in this country and abroad—the demand is ever increasing. Also, new fields are being opened up—notably in the Far East; and the outlook is distinctly hopeful.

With tar products, however, I am afraid we cannot have the same hopeful feeling. So long as the demand for any article is maintained at a level equal to the production, an even market can be expected. But should the production exceed the demand by a very narrow margin, the fall in value of the total production is out of all proportion to the small surplus which has caused the slump. The normal increase of tar production at gas-works would probably not affect the market to any extent; but the greatly increased production arising from coke-oven recovery plants will probably have a serious effect on the tar products markets in the near future. Many of these coking plants have been erected to produce coke from coal dust at collieries where the dust was formerly made into briquettes; so that they have not only become tar products producers, but have ceased to be tar products consumers. Every effort must be made to find new outlets for our tar. Something has been done in the matter of road surface treatment, and something in the renewal of the practice of making coal-tar macadam roads. But these are comparatively small outlets for a raw material which, consisting, as it does, of rich hydrocarbons, ought to be of greater value to the manufacturing world than to be buried in road-making in its raw state. Something, also, has been done in substituting benzol for lighter spirit as a source of motive power in spirit motor engines; and it is to be hoped that further progress will be made in this direction.

The demand for creosote, fortunately, is still slightly in excess of the production; and pitch has increased in value recently. But, unless some new market is created, it is difficult to look on the increasing production without grave fears for the future.

A Survey of the Carbonizing Field.

Our ideas on the subject of carbonization are undergoing complete transformation. Until quite recently, a thin layer of coal gasified in the least possible duration of time was considered to be the acme of perfection for obtaining the best possible results, not only from the coal, but also from the floor-space of the retort used—in other words, for the amount of capital employed, and also the cost of labour involved. As long ago as 1896, an installation of coking-ovens was erected in Halifax (Nova Scotia) for the purpose of carbonizing coal in bulk, and supplying therefrom illuminating gas for the lighting of the town. This was followed by installations at Boston and other places in the States. But it was found that it was possible to utilize for illuminating purposes the gas produced during a comparatively small proportion of the period necessary for complete carbonization of the whole charge. Those who have studied the curves obtained by Professor Bunte, showing the illuminating power of the gas produced at various stages of a charge undergoing carbonization for twenty-four hours, will readily understand that this must be so. The curve shows that, for a few minutes in the first hour, the gas attains its highest value—being at the end of the second hour only a little more than half the value, while at the end of the fourth hour it is little more than one-third, and during the last nine hours there is a sharp curve from this point to nil.

Our Continental brethren, in the meantime, directed their attention to the vertical retort; and they have succeeded in evolving a very fine gas-producing and coke-making plant—obtaining their results with the minimum expenditure of labour. The coke that results from the vertical retorts on the Continent is excellent in quality, and a good yield of gas per ton is obtained; but the illuminating power is only from 10 to 12 candles, tested by the "Metropolitan" No. 2 burner. The calorific value, however, is higher than one would expect, and is sufficient to satisfy the requirements of supply demanded from our Continental friends. We have not yet, in England, arrived at the point where illuminating power can be ignored, and calorific value only be considered. This fact has led to many other experiments in coal carbonization. Continuous carbonization in vertical retorts has been the aim of those indefatigable workers, Messrs. Woodall and Duckham; and there is no doubt they have overcome the mechanical difficulties of such a process, and have achieved success. Messrs. Glover and West, following on similar lines, have also scored a success in the continuously charged vertical retort; and, reviewed in the light of our old experience of carbonization, it seems theoretically correct that a continuously moving charge passing through the carbonizing vessel in a comparatively short period of time—say from seven to nine hours—would be more likely to produce a gas of even illuminating power and of a sufficiently high quality, than a similar quantity of coal charged into a vessel and allowed to stew for twelve or even twenty-four hours.

Here, however, another surprise awaits us. From various parts

of the country we have reports of experiments where retorts—vertical, horizontal, and inclined—filled quite full of coal and allowed to carbonize for a lengthened period—have given results in which every product is increased in value. The yield of gas is largely increased without any diminution of illuminating power; the coke is of a better quality and there is more of it; the yield of tar is greater and the quality much better; the sulphate of ammonia produced is also increased; and sulphur compounds and naphthalene are also eliminated. After reading the reports of these results, there can be little wonder that any engineer contemplating the erection of new carbonizing plant hesitates to adopt even the very latest development in that field. He may well wonder where all the leakage could have taken place in his existing plant when he reads of the large all-round gains claimed for admittedly experimental plant, and speculates as to whether perfected apparatus will give still further advantages. I may, perhaps, be permitted to remind you that our Continental friends, with their fine installations of vertical retorts, do not claim to have obtained the great results enumerated above—especially with respect to illuminating power. The illuminating power of gas is still the legal standard of its value in England; and the cost of producing gas of such illuminating power as will conform to our legal requirements must still be the criterion of the success, or otherwise, of any process of gas manufacture.

AMERICAN CARBONIZING PRACTICE UP-TO-DATE.

In the United States our brethren are also working on the carbonizing problem. In a works having a large installation of inclined retorts, each retort being 20 feet by 26 inches by 15 inches, their practice for a considerable time has been to fill the retorts quite full, and raise the temperature so that the charge is thoroughly carbonized in six hours. The temperature in the combustion chamber is maintained at 2500° Fahr., giving an average of about 2000° Fahr. in the retorts.

Our American friends supply a gas of much higher illuminating power than we do—from 20 to 22 candles being the usual standard. The results at the works here quoted are 11,580 cubic feet per ton, of 17·19 candles; and the coke, tar, and sulphate are not appreciably affected. The yield of gas is 20,500 cubic feet per retort per day; and the make per man per day is 132,000 cubic feet. This latter figure includes foremen, stokers, firemen, scurfers, and quenchers—in other words, the whole of the labour from the coal hopper to the coke conveyor. In another works, horizontal retorts have been constructed consisting of pure silica material. These retorts are built up of segmental tiles, very similar to those used so successfully by Mr. Hack at Birmingham. These retorts are 15 feet long by 26 inches by 16 inches; and they are charged and discharged at one operation. The scoop containing the charge acts as a discharging ram, and is so constructed that it leaves almost a full charge in the retort. The space left unfilled is only about 3 inches from the top of the retort. Experiments were made to ascertain the temperature and duration of charge which would give the best results; and it was finally decided that these were obtained when a temperature of 2000° Fahr. was maintained, and the charge allowed to remain in the retort for seven hours. Under these conditions they produced 12,118 cubic feet of gas per ton, of 16·2 candles, tested by the "London" No. 1 argand. This is claimed to be a considerable advantage over their former practice with the same coal. It appears in both cases that the increased yield of gas results in a decreased illuminating power; but the decrease in illuminating power is not in the same ratio as the increase in yield per ton, so that, calculated in candle-feet per ton, there is a distinct gain.

SYSTEM IN STUDY AND WORK.

With these and other problems facing us, it is fortunate that those who are now training to follow us as engineers have the advantage of obtaining thoroughly technical education before applying themselves to the exclusive and serious study of their own profession. Whatever the scholastic attainments of any young aspirant, let me most earnestly suggest that at least one year's training should be taken in the engineer's fitting shop at a gas-works. I do not know of any better method of obtaining a full insight into the construction of every part of the appliances than to have to assist in the repairing of them. It gives a practical grip of detail which I do not think can be obtained in any other manner; and, above all, it ought to teach the young engineer what manner of men he hopes some day to manage. It will show him their strength and also their weakness; it will help him to admire the one and give him the desire to improve the other; and, above all, it ought to teach him how easy it is to work with the men instead of against them, as so many beginners are inclined to do. This will help him on to a solution of any labour difficulties which may arise. The initial success of the profit-sharing scheme at the South Metropolitan Gas Company was due, I am sure, quite as much to Sir George Livesey's keen interest in all that pertained to the true well-being of his men, and their knowledge of that fact, as to the promise of benefits likely to accrue to the men, of which, in the beginning, they could only have had a hazy and indistinct idea.

While on the subject of the training of a gas engineer, let me also impress upon the pupil the value of system. The daily task is a most important one. Let every day carry its own burden—the putting off even of small things results very quickly in an intolerable burden; and let him make every part of his duty a daily one, as far as possible. It is too late at the end of a month to make the discovery that a discrepancy has taken place—the damage is already done. But by systematic and daily routine, these leakages and discrepancies can be detected and rectified at once. This applies quite as much to the commercial side of our work as to the engineering. Let me give an example of system as applied to the commercial side of our responsibilities—viz., the collection of accounts. It is quite as important to collect all the money earned as it is to earn it. The total area of supply is divided into districts, and each district is again subdivided, corresponding to divisions in the meter-reading books. The reading of meters is begun on the twenty-fourth day of each third month and finished on the seventh of the succeeding month. As each reading-book is finished, it is seized upon by the collector, who transfers the indices to his collecting book, which consists of bill, receipt, and counterfoil. While recording the index of the meter, he calculates the charge and makes out the bill. The reading-book is handed to the rental-clerk, who makes the charge in the rental book; and then the collector's book and the rentals are checked the one by the other. On the first day in each quarter, the collector begins delivering bills; and if he does not receive payment, he stamps on the bill a notification that his second call will be made upon a certain date. The whole of his first round is completed before the end of the first month of the quarter. The second round is then begun and finished, after which the collector has ample time to send out various notices to the laggards. As the quarter lengthens, the notices increase in urgency, until, finally, a few summonses wind up the quarter. In the meanwhile, the collector has time to prepare his collecting books for the next quarter. I do not think there is anything very exceptional in this account of a collector's work—excepting the extreme regularity of the system, and the ease with which the bills are distributed early in the quarter to the consumers. But mark the result of this system. Our collection for the last seven years has averaged 99·89 per cent., and for eight quarters not a single arrear has been carried forward. The introduction of so simple a system has saved a considerable sum of money in bad debts, &c., every year.

COMMERCIAL TRAINING.

My reason for giving an example of system as applied to the commercial side of our business is that in the training of a young gas engineer, his commercial instincts are usually left to develop by chance—no special training being given. Nearly all Provincial gas engineers have the management of the commercial part of the business under their control, as well as the manufacture and distribution of gas; and a great responsibility rests upon them, not only in conducting the affairs of their undertakings on thoroughly commercial lines, but also in advising their directors or committees as to the probable trend of markets for the purchase of their requirements and the sale of their products. In addition to these qualifications, it is necessary that every gas engineer should be able to advise his customers as to the best means of obtaining the greatest efficiency from the gas consumed, for lighting, for fuel, and for motive power.

ACTIVITY IN THE DISTRIBUTION DEPARTMENT.

It may appear to be late in the day to emphasize the necessity for gas undertakings to have a department devoted to the supply of all appliances for the consumption of gas; but, unfortunately, there are still a considerable number of places where the interest of the gas supplier appears to stop short at the meter. Having in view the severe competition of electricity, both for lighting and motive power, the gas supplier cannot afford to remain inactive. He, only, is in a position to actively combat this competition; and, without interfering in the least with the ordinary business of the local gas-fitters, he can offer such inducements to the consumer of electricity as may tempt him to transfer his lighting account to the gas supplier. The supplying of efficient and economical lamps and burners, and the yearly maintenance of them at a fixed price, may be mentioned as examples of these inducements. In Hull, we have a show-room equipped with an able staff of officers and workmen, and furnished with the most modern examples of efficient gas appliances. The lighting of tradesmen's premises, both internally and externally, has been made a special feature of this establishment; and to-day we have in use on the maintenance plan 1254 lamps, representing 5016 burners, nearly the whole of which have superseded electricity.

GAS-FIRES AND RADIANT HEAT.

The subject of heating rooms by means of gas-fires has received an increasing share of attention during the last few years; and the report of the experiments conducted by Mr. E. W. Smith and the Committee appointed by the Council of the Institution of Gas Engineers is an interesting addition to our knowledge on this subject. It is my opinion, however, that they have accepted too readily the theory that rooms can be heated by radiated heat alone. I admit that, in a room in which the air is already warm, the sensation of receiving heat from a radiant surface is a pleasant one; but it must not be forgotten that radiated heat, *per se*, cannot heat air. Even the sun's rays passing through our atmosphere do not appreciably raise the temperature of the air. If the sun's rays could communicate their heat directly to the air through which they pass, they could only reach the earth's surface after they had raised the whole atmosphere to a temperature that would be not only unendurable, but fatal to life. The sun's rays, as you are all aware, heat our atmosphere by convection—that is to say, they must first heat the surface of the earth, which, in its turn, gives up its heat to the atmosphere by convection. Is it likely that the

rays of heat from a puny gas-fire will act differently from those of the sun? Of course, it is pointed out that the rays of heat from a fire falling upon, and being absorbed by, the walls and furniture of a room, do, by convection, gradually heat the atmosphere of the room. That fact is granted. But surely there are more economical and efficient methods than this of heating air by convection. In all countries where the winters are rigorous, it is found by practical experience that the air of dwellings must be heated by convection to secure comfort. It is stated that heating air by convection dries it. Why should it? The mere heating of air does not decompose the moisture the air contains. At my request, the late Mr. Thomas Fletcher conducted experiments on this subject, and the results were published in our Technical Press. Mr. Fletcher found that there was no difference in the moisture of the air in rooms of the same temperature heated by incandescent gas-fire or coal-fire. Even when the room was heated by an incandescent gas-fire, assisted by a low-power air-heating arrangement, the results were the same. Dr. Rideal, in his interesting experiments on the relative hygienic values of gas and electric lighting, found that the action of the surfaces of a room had a considerable influence on humidity. He says: "These, though apparently dry, hold moisture in large quantities; so that a shallow layer of the surface of the walls and ceiling contains more water than all the air in the room. There is, ordinarily, a continual exchange between the air and the room surfaces—if either becomes moister, it gives up water; if either becomes dryer, it receives moisture. In this way, the walls serve as a compensating reservoir to help to maintain the humidity of the air approximately constant."

In heating rooms artificially, we must copy the lesson given us by Nature. Neither radiation alone, nor convection alone, can be satisfactory; but a judicious blending of the two will, I feel convinced, give the most satisfactory results. The best gas-fires of a few years ago aimed at this happy combination—whether by accident or design I am unable to say; but it is certainly true that those fires which, by their construction, yielded a large amount of convected heat and a fair proportion of heat by direct radiation, when fixed so that a good chimney draught was obtained, gave the most comfortable, most efficient, and most economical results.

THE ART OF ADVERTISING.

No gas engineer in these days waits for the customer to apply to him. He must discover the customer—he must attract public attention in season and out of season to the wares he has for sale. He must advertise freely and judiciously. As an old advertiser, I would warn against prolix advertising—advertisements which contain too much reading matter are apt to be cast aside unread. Let your advertising be novel, terse, and epigrammatic. Anything alliterative is almost sure to catch the public eye. I need scarcely say, unlike some advertisers, we must keep our advertisements well within the bounds of truth. Every year new business becomes more difficult to obtain; but I am sure I am expressing your views when I say that each one of us has confidence in the future of our industry. And, in thanking you for the patient attention you have given to this address, I wish each one may have a successful and progressive year.

At the close of the address,

Mr. T. GLOVER (Norwich) said it was his duty to move a vote of thanks to the President for his address. The members knew they would have a deliverance from Mr. Young that would be bright and up-to-date, and one to which it would be a pleasure to listen. Although it was out of order to discuss a presidential address, Mr. Young would permit him to congratulate him upon his 99·89 per cent. of collections, and upon the absence of bad debts. It was certainly splendid; and something for many of them to aim at. They were thankful to the President for his wise hints to the gas engineers who had pupils at their works, and to the young men who were aiming at becoming gas engineers; and particularly were they grateful for one wise sentence: "Let every day carry its own burden; the putting off even of small things results very quickly in an intolerable burden." If this was only remembered by the young as well as the old, it would do good. He also thanked the President for drawing attention to the fact that radiant heat thrown through space was of no use alone. He thought that, when radiant heat was being extolled so much, to the detriment of the other forms of heating air, it should be recognized that the great mistake that was being made was in heating air to too high a temperature on too small a surface. If they had a large volume of heat at a low temperature, in addition to the radiant heat, they would get much more pleasant effects. It was a fact that radiant heat alone was very expensive. They also agreed with Mr. Young's sentiments as to looking after their customers, and not leaving the customers to look up the gas suppliers. They also thanked him for his hints on gas advertising. The paper that Mr. Young read in Norwich some ten years or so ago was well in memory. Then he gave them some splendid hints as to advertising; and it was interesting to notice that their President had not changed his mind about this, and that it had proved so very successful.

Mr. J. H. TROUGHTON (Newmarket) seconded the motion; and it was unanimously carried.

The PRESIDENT, in responding, said it gave him great pleasure to hear that he had not bored the members. The difficulty of producing an address increased as each one slid into the past. The next man who tried the job had a worse task to perform than his predecessor. However, if the address had given the members as much pleasure as it had him to write it, he was more than repaid for any little trouble he had taken. He thanked the members most sincerely.

GAS PRACTICES AT GREAT YARMOUTH.

The members next proceeded to discuss the paper read by Mr. W. J. Carpenter at the Stamford meeting in April last. A report of the discussion appears on p. 828.

GASHOLDER RECONSTRUCTION.

Following, came a paper on the above subject by Mr. JOHN HOLLIDAY, of the East Hull Gas Company. It was illustrated by a number of well-executed lantern slides. The paper, with the diagrams exhibited and some of the photographs shown, will appear in next week's issue. There was no discussion upon it.

THANKS TO AUTHORS.

Mr. RUGGLES, in proposing a vote of thanks to Mr. Carpenter and Mr. Holliday, and referring to the paper by the latter, said it had been most interesting, especially the slides illustrating the progress of the works. The contractors in this instance must have hurried up well. The views showed distinctly what could be done if such work was to be carried out quickly.

Mr. J. CARTER (Lincoln), in seconding, said they had listened to Mr. Holliday's paper with great interest, and had looked with equal interest upon the artistic productions he had projected on the screen. Both Mr. Carpenter's and Mr. Holliday's papers possessed the most useful qualities of contributions to the proceedings of such meetings.

The motion was heartily agreed to.

Mr. HOLLIDAY, in reply, said he had prepared the paper because he thought it would serve to create a little more interest in the holder the members were going to inspect next day. It had afforded him a great deal of interest to prepare the paper; and perhaps the difficulties met with in connection with the holder, and the way they had been dealt with, might at some time be of service to the members.

Mr. CARPENTER also expressed his acknowledgments.

THE LIVESEY MEMORIAL FUND.

The PRESIDENT said the members would have noticed on the *agenda* that a resolution was to be brought before them respecting a contribution to the Sir George Livesey Memorial Fund. He had pleasure in proposing that ten guineas be voted from the funds of the Association towards this laudable object. It was quite unnecessary for him to add anything to the mere resolution. Sir George was a very great figure in the gas industry; and he was a great figure in the hearts of all who knew him.

Mr. RUGGLES had much pleasure in seconding the resolution.

Mr. WIMHURST remarked that he was hoping the Committee were going to make the contribution twenty guineas. He understood from the Technical Press, after the June meeting of the Institution, that this was the sum to be contributed.

The PRESIDENT said he thought the funds of the Association were only large enough to warrant support to the extent of ten guineas. They would hardly be justified in giving twenty.

The motion was unanimously carried.

PLACE OF NEXT MEETING.

The HON. SECRETARY, at the request of the President, read a letter from Mr. Carpenter, of Yarmouth. The letter had reference to a proposal to hold the next spring meeting at Yarmouth; and Mr. Carpenter was pleased to say that, at a meeting of his Directors, it was resolved to offer a cordial invitation to the Association to visit Yarmouth in April next.

Mr. WIMHURST proposed that the invitation be received with hearty thanks. He well remembered the two meetings that were held at Yarmouth in the earlier years of the Association; and he knew they could not do better than receive the kind offer.

Mr. J. AUCHTERLONIE (Cambridge) seconded the motion; and it was cordially passed.

Mr. CARPENTER, on behalf of the Chairman and Directors of the Company, thanked the members for accepting the invitation. The Chairman and Directors were quite content to think that an Association of this character would honour Great Yarmouth by their presence. He could assure the members his Chairman and Directors, as well as himself, would do their utmost to make the meeting as interesting and instructive as possible. He believed the Directors of the Water Company, who were closely allied with those of the Gas Company, would extend an invitation to the members to visit their beautiful works situated in a beautiful locality. If this could be arranged, he was sure it would be a matter of pleasure and profit to everyone.

Mr. WIMHURST thought there would be an inducement to the members to stay the week-end at Yarmouth if the meeting were held on Friday.

The PRESIDENT said the point should receive the careful consideration of the Committee.

This concluded the business part of the proceedings.

DINNER.

In the evening, the members dined together; the President occupying the chair. The Mayor of Hull (Mr. H. Feldman) was unable to be present; but among the guests were a number of local gentlemen. After dinner, a few toasts were honoured.

Mr. J. J. RUNTON, the Chairman of the East Hull Gas Company,

proposed "The Eastern Counties Gas Managers' Association." He urged the members to take steps to put themselves on the same level as the civil engineers by obtaining a Charter for the parent body, as a pecuniary value would attach to it.

The PRESIDENT, in reply, said it was the friendly intercourse which took place between the members that made for the good of their profession. Some of them were old enough to remember the time when every gas engineer had a secret process of his own; but now "not a sparrow fell to the ground in Gravesend but what the man in Hull knew of it in a very short time." Their American brethren had not yet reached this pitch. They were very jealous of what went on inside their works. But they would get over this, and find that an interchange of ideas was beneficial to themselves. He did not know of any body of men who so freely gave of their knowledge to each other as gas engineers; and he was perfectly certain that as long as this spirit filled their hearts, the success of the Association was assured.

Mr. R. G. SHADBOLT thanked the British Gaslight Company and the East Hull Gas Company for their most hospitable reception of the members.

Major-General CORRIE and Mr. RUNTON having warmly acknowledged the compliment,

Mr. J. CARTER proposed "The City and Trade of Hull;" saying he was bold enough to enunciate his belief in the municipalization of gas-works. At the same time, he paid a tribute to the two Companies established in Hull.

Alderman G. HALL, in reply, said they had no fault to find with the British Gaslight Company, by whom the city was admirably served. In saying this, he was not speaking in any way disrespectfully of the other Company.

Sir ALFRED GELDER also responded to the toast. He said there was scarcely any occasion for the Hull Corporation to municipalize the gas-works, as there was in the case of others who were seeking new powers from Parliament. Hull was in a fortunate position; and he assured the members that the Corporation were quite happy and contented with the treatment meted out to them by the two Gas Companies in the city.

Mr. W. J. CARPENTER proposed "Kindred Associations."

Mr. T. GLOVER, in reply, said the parent body in London, as was shown by their meetings, was fully alive and active. It was healthy, and it was still needed. Their technical programme was followed with very great interest. It might be, as some of the Technical Press said it was, somewhat lacking in conclusiveness; but this must be so when they undertook new work and were breaking fresh ground. He hoped the members would not be impatient, but would continue to give them the support which was needed if the new work they had commenced was to be made useful to the industry as a whole. The conditions of the industry were constantly changing; and they needed to be alert to provide for these changes by adapting themselves to them. It was true that only those organisms survived which adapted themselves to their environment. They were met that night in an electrically-lighted room; and they had abundance of evidence everywhere they went that the electric light, which at one time they affected to despise, was not to be despised, but must be recognized as a permanent thing. At the same time, however, they had abundance of evidence that the gas industry was not being "snuffed out" by the success of the electric light. They and the communities they served had found other uses for gas than lighting; and consumers were only too glad to have it when it was supplied under conditions which enabled them to use it with advantage. So that if suppliers of gas adapted themselves to the new and changing times, there would be an extended existence for gas, and a future as brilliant, they hoped, with success as the past had been.

Mr. W. LANGFORD (the President of the Midland Association) also replied to the toast. He remarked that healthy competition was good in every industry; and he was not at all anxious or sorry that electricity had come in to compete with them as suppliers of artificial light. He believed that if they did their level-best to keep before their customers the advantages of gas for lighting and for heating purposes, they would have nothing to fear. On the other hand, they could not disguise the fact that the metallic filament lamp, as lately introduced for electric lighting, had come to stay, and was a powerful competitor with gas. Still, he saw no reason to fear the continued progress, and the ultimate success, of their undertakings. In the presence of the representatives of many of the best firms in England, he wished to say he did not feel satisfied with any of the gas-fires on the market. In his opinion, they wanted a fire which should be adaptable not only for the bedroom and the drawing-room, but also for their sitting and dining rooms; and at present—he wished to be candid—he did not think they had a fire they could recommend as they would like to do. He was pleased with the remarks in the President's address on the question of heating, and he urged that they must push heating and cooking by gas as much as possible.

VISITS TO THE HULL GAS-WORKS.

The following day the programme of instruction and interest was continued. At ten o'clock, the members were conveyed by carriages first to the works of the British Gaslight Company, over which they were conducted by the President and his Assistants. An outline of what was seen is supplied in the following description; but amplification of certain parts will be found in the illustrated articles that appeared in the "JOURNAL" for June 12 and 19, 1906, and in the paper on "Tar Distillation" read by Mr. Young at the meeting of the Association a year ago.

DESCRIPTION OF THE HULL WORKS OF THE BRITISH GASLIGHT COMPANY.

The area of land belonging to the Company equals 40 acres, of which one-half is occupied by the buildings and plant. On the eastern boundary, is the River Hull flowing on its way to the Humber; and, being a tidal river, a large proportion of the Company's coal is received by boat. On the other hand, they are able to forward their coke, pitch, sulphate, &c., to the docks by keels for shipment. On the south side, is the Hull and Barnsley Railway on the high level, attached to which are the Company's sidings, weighing-machine, and viaducts, supported on columns running into the coal-stores at the height of 14 feet, where all coal-waggons can be speedily emptied by opening the bottom doors. All other classes of goods received by rail are distributed over the works by the Company's own locomotive engine on lines specially laid for the purpose.

The coal received by river is filled into large pans, and picked up by hydraulic cranes, weighed, and dropped into the coal-breaker before being taken to the store by a gravity-bucket conveyor, which reaches from the river side to the far end of the coal-store. A specially-constructed trench runs the length of the coal-store below the floor level, where the gravity buckets can be filled with coal out of stock, and dropped into the elevator boot when necessary. There are four coal-stores with a total storage capacity of about 11,000 tons.

Carbonizing.—There are three retort-houses for this work; No. 1 house being the latest. It was built on the site of the old No. 1 house. This house was erected in 1904, and contains twelve beds (eights) of inclined retorts in two sections of six beds each, equal to about 1½ million cubic feet per 24 hours. The coal is taken by the elevator and placed by the push-plate conveyors into continuous hoppers. The six-hour charges of coal for each retort are measured and dropped into the retorts, which are 15 inches by 24 inches and 20 feet long. The coke when drawn is taken by the hot-coke conveyor to the gravity-bucket conveyor and deposited in the yard. All the machinery in this house is driven by three gas-engines—viz., one for the coal into stock, one for the elevator and push-plate conveyors, and one for the coke-conveyors.

No. 2 house to replace the old No. 2 house is not yet built. No. 3 house was erected in the year 1884. It contains twenty beds (sevens) of horizontal retorts, 22 inches by 16 inches by 20 feet long. The beds are heated by direct firing; and all the work is done by manual labour. The house is capable of making 1¾ million cubic feet in 24 hours.

No. 4 house, which was erected in 1894, contains twenty beds (eights) of horizontal retorts, 15 inches by 22 inches by 20 feet long. This house can make 2¼ million cubic feet, has a stage-floor, and each through bed has one regenerator furnace, There is a coal-store on each side, from which the coal is admitted by sliding-doors into the coal-breakers and elevated into storage hoppers, two on each side, ready to supply the charging-machines. On each side of the retort-bench one charging and one drawing machine on the Arrol-Foulis system are at work; the complete installation having been supplied by Messrs. Sir Wm. Arrol and Co. Nos. 1 and 4 retort-houses are fitted with governors and tar-towers.

Condensers.—There are two atmospheric condensers (battery and annular) for No. 1 retort-house, and water-cooled condensers for Nos. 3 and 4 houses, erected by Messrs. Clapham Brothers, Limited.

Exhausters.—Four exhausters are in the main engine-house; two driven with horizontal and two with vertical steam-engines. The steam is raised in two Lancashire boilers fitted with Wilton's patent furnaces for burning breeze. There is also a hydraulic engine and accumulator in the house for driving the cranes on the wharf and hoist in the yard.

Scrubbers.—Two tower-washers, 42 ft. by 7 ft. 6 in. diameter, fitted with tar-extractors and wood grids above, also three tower-scrubbers (C. & W. Walker's make), 50 feet by 12 feet diameter, fitted with Livesey tar-extractors and filled with wood grids, are ready for use as required for dealing with the crude gas by washing with liquor; while two "Standard" scrubber-washers are used for the final washing with clean water. A portion of each of the "Standard" washers is also fitted for extracting naphthalene when necessary.

Purifiers.—The stream of gas is divided into two in passing through the purifiers; each section (A and B) consisting of six purfiers, 30 feet square by 5 feet deep, all fitted with Spencer's grids, which are found to greatly reduce the pressure and the number of times refilling. The purifiers are worked with four-way valves, and only oxide is used.

Meters.—There are two station meters—one 100,000 cubic feet and the other 150,000 cubic feet per hour.

Gasholders.—No. 1 is used for the carburetted water gas, while Nos. 2, 3, 4, 5, and 6 are required for coal gas. The two largest are Nos. 5 and 6. The former is 160 feet diameter by 108 feet high, and holds 2 million cubic feet; while the latter is 200 feet diameter by 120 feet high, and holds 3½ million cubic feet.

Connections.—All the gas connections throughout the works are 24 inches diameter to the gasholders.

Governors.—There are three governors for regulating the supply of gas to the town.

Carburetted Water-Gas Plant.—This comprises two complete sets, erected in 1899, of Messrs. Humphreys and Glasgow's plant, each set capable of making a million cubic feet per 24 hours. There are two Lancashire boilers working at 100 lbs. pressure, and fitted with Wilton's patent furnaces for burning breeze. In the same building, there is room for two more similar sets of generators, &c. The purifiers are four in number, 30 feet square by 5 feet deep, and filled with ordinary grids and oxide, with the addition of a layer of breeze at the bottom to remove traces of tar. There is a separate station-meter for measuring the gas previous to mixing with the coal gas on its way to the holders.

Tar-Works.—These include five direct-fired stills, each capable of holding 2000 gallons of tar, with condensers, receivers, and

necessary storage tanks for the various distillates; the smothering chamber for cooling the pitch; and the pitch bed, where it is stored for shipment. All the stills are fired with coke. There is a Lancashire boiler, 28 ft. by 7 ft. 6 in. diameter, for supplying steam to the pumps and stills. There is also a complete plant for the recovery of anthracene. These works were erected 32 years ago. The products are naphtha, light oil, creosote, and pitch.

Sulphate-Works.—The still is by Messrs. C. & W. Walker, with liming-chamber included, and the saturator, of solid lead plate, was made by Messrs. Joseph Taylor and Co., of Bolton; the whole being capable of turning out six tons of sulphate per 24 hours. There are two Lancashire boilers for providing the necessary steam for still, pumps, &c., fitted for burning breeze. In connection with this department, there is a Claus sulphur recovery plant for dealing with the waste gases from the saturator after their condensation. These gases are passed through a washer to free them from tarry matter, and then into a kiln containing oxide of iron placed on checker brickwork. The gases, mixed with air, produce spontaneous combustion, and the sulphur is eliminated and deposited in a dry state as the burnt gases pass through a large brick chamber with baffle-walls placed crossways, 2 feet apart. A limestone tower washer throws down the sulphurous acid, and the sulphuretted hydrogen is passed into an oxide purifier—thus preventing nuisance. The amount of recovered sulphur is about 50 tons a year; and it finds a ready market.

Workshops, Etc.—There are blacksmiths, fitters, joiners, painters, and meter shops, stables for nine horses, stores, foreman stoker's room, and messrooms for the stokers and yardmen, with cook's kitchen and utensils. Adjoining are the lavatories and baths, &c., for general use by all workmen.

Water Softening.—All steam-boilers are provided with a supply of water softened in special storage tanks. The water is pumped from the river at low water and treated so as to reduce the hardness to a minimum. There are three tanks adjoining each other, any of which will last 24 hours, so that plenty of time is given for any sediment to settle. The freedom of the boilers from scale and corrosion is ample proof that the system is all that can be desired.

Leaving the works of the British Gas Company, the members drove to the works of the East Hull Gas Company, over which they were conducted by Mr. Holliday and his Assistants. Distinctive features of interest were the four-lift spiral-guided holder described by Mr. Holliday at the meeting the previous day, and the Feld sulphuretted hydrogen plant, which was described last week (p. 761), and upon which some further particulars by Herr Feld are published this week on p. 816. The system (the contractors for which are Messrs. R. & J. Dempster) was explained by Mr. Schmidt in the absence of Mr. Feld. The party afterwards visited the Garden City, and were then entertained at luncheon at the Royal Station Hotel by the Directors of the East Hull Gas Company. Mr. J. J. Runton presided. At this gathering, Mr. Holliday explained that the Feld process had merely been adopted for the sake of economy in the matter of ground space—they had not room enough to erect lime and oxide purifiers.

A Veteran in the Gas Industry.

Veterans in the gas industry, as well as those assisting in its modern improvements and triumphs, will be interested to learn that Mr. William W. Box, one of the earliest pioneers, is living in retirement at Herne Bay. Mr. Box, who is in his 88th year, is enjoying the best of health, and takes not only a keen interest in the progress of the gas industry, but also in every-day affairs and even in politics. Interviewed recently, Mr. Box stated that he entered the gas business in London, working for the firm of Mr. Barlow, whose son was the late Mr. Thomas G. Barlow, who founded and first edited the "JOURNAL." This would be about 76 years ago; so that Mr. Box may claim to be one of the oldest, if not absolutely the oldest, man in the gas profession. Under Mr. Barlow, Mr. Box, who was then a lad, assisted in the fitting-up of the first gas-works at Salisbury with three beds of three retorts each and a single-lift holder, making the first gas and lighting up the town. Thence, under the same firm, he proceeded to Romsey, erecting works of the same size, and giving that town also gas lighting for the first time. Subsequently Birkenhead was visited and equipped with similar works. Promotion now came to Mr. Box, and he was appointed Manager of the gas and water works at Chester for the London and North-Western Railway Company. Management of the works at Old Ford, Bow, followed; and eventually Mr. Box found himself at Newbury, in Berkshire. His position there he relinquished to take the management of a gas tube and fitting works at Birmingham, under Messrs. James Toy and Son. Management of the Walton-on-Thames Gas-Works under Mr. H. P. Stephenson, the Engineer, was the next move; and thence Mr. Box went to Ely, in Cambridgeshire. Finally he took service under the West Kent Gas Company at Crayford, and held the position of Manager for about thirty years. This was his last appointment. There is probably no man living who has had a more varied or a longer experience of the gas industry in its different branches; and, as illustrative of Mr. Box's inventive faculty, it may be mentioned that patents have been granted to him for luted retort-lid fasteners, anti-dips, a scrubber-washer, puttyless lamps, self-sealing mouthpieces, ascension-pipes, railway metal joints, horseshoes, furniture ball castors, and cupboard fasteners.

GAS PRACTICES AT GREAT YARMOUTH.

An Interesting Discussion on Commercial Topics.

It will be remembered that at the meeting of the Eastern Counties Association at Stamford on April 21 last, Mr. W. J. CARPENTER, the Engineer and Manager of the Great Yarmouth Gas Company, read a paper on the above subject. It contained a large amount of compilation, and showed considerable industry in preparation on Mr. Carpenter's part. It was thought that, in order to do justice to the contribution, the discussion should be postponed to the autumn meeting; and therefore, at Hull last Thursday, the members gave the paper the consideration that the intervening time had enabled them to prepare for.

The PRESIDENT (Mr. John Young) said the meeting was open for the discussion of the paper. It was an interesting one, full of detail; and he was quite sure a number of members were anxious to say something about it.

Mr. F. PATERNOSTER (Felixstowe) said he was glad the discussion on the paper had been postponed until that day, as it had enabled him to make a few comparisons which he would not have been able to do on the spur of the moment immediately after the reading of the paper. It was hardly a paper that one could criticize; but he presumed the chief object in postponing the discussion had been to enable others to compare the Yarmouth results with their own. He should be glad to tell the members what they had been doing at Felixstowe. But first of all he must thank Mr. Carpenter for the opportunity he had given him for doing this by publishing figures that were fairly comparable with his (Mr. Paternoster's) own; for to fairly compare the working of a company at a seaside resort with one supplying an inland town was in most cases an impossibility. The first points that struck him were the particulars Mr. Carpenter gave with reference to his slot-meter installations and the cost of collection. He said that at Yarmouth practically no limit was determined respecting the requirements of the slot-meter consumer. Mr. Carpenter made his collections twice monthly; and the average monthly amount collected per consumer was 4s. 2d. The cost of collection per annum was equal to 1s. 3·24d. At Felixstowe, they did not give the slot consumers everything they wanted. The question in his mind was whether Mr. Carpenter could not do as well by not giving them everything they asked for. He (Mr. Paternoster) went into the matter very carefully. At Felixstowe, they limited the installations to three lights, a gas-ring, and a point for a cooker. But they made consumers hire the cookers; and they had no difficulty in getting monthly rentals for them. The average monthly collection per consumer was 4s. 2¾d., or ¾d. more than in the case of Mr. Carpenter. But at Yarmouth, everything was given that the slot consumer asked for; at Felixstowe the slot consumer was limited. With a cooker, the average collection was much more—6s. 8d. Collecting once monthly, the cost to the Company at Felixstowe was about 1s. a year. Coming to the question of naphthalene, he (Mr. Paternoster) had no experience of it; but Mr. Carpenter made a curious remark in reference to the subject that had attracted his attention. The paper said:

> **It is now an accepted idea in the management of gas affairs in Great Yarmouth that more trouble has been found through the deposition of naphthalene in the services after salt water had been substituted for that of the town water supply. This opinion has been formed by the close observance of the prevalence of complaints as to the supply of gas and otherwise in certain districts most freely deluged with the briny element.**

He should like to ask Mr. Carpenter whether he meant to infer that street watering by salt water induced a deposit of naphthalene in the mains and services. Mr. Carpenter gave an interesting table with reference to his coke sales. He mentioned the tonnage per cent. of total sales; the local sales unbroken, and the local sales broken—tonnage per cent. of total sales. He (Mr. Paternoster) thought it would be interesting if he worked his figures out in the same way; and he had taken five years. He noticed that Mr. Carpenter's figure for 1904 was 28·5 per cent. of total sales of coke on rail; his own at Felixstowe was 37·58. The Yarmouth percentage of local sales unbroken was 58·3; that of Felixstowe, 59·26. The Yarmouth percentage of local sales broken was 13·2; that of Felixstowe 3·16. In 1908, the Yarmouth percentage of total sales on rail was 41·5; that of Felixstowe, 22·84. The Yarmouth percentage of local sales unbroken was 44·7; that of Felixstowe, 52·80. The percentage of broken sales at Yarmouth was 13·8; and at Felixstowe 24·36. Then he came to what was one of the most interesting tables in the paper. That was the one showing the yearly output of gas, with the proportion due to day consumption. He had taken Mr. Carpenter's figures from 1904 to 1908, and compared them with the same period at Felixstowe. Yarmouth figures for those years were 43·66, 43·43, 44·3, 45·01, 45·35; at Felixstowe they were 44·22, 46·19, 48·56, 51·62, 52·20. From this it would be seen that at Felixstowe they had succeeded in the last two years in selling more than 50 per cent. of the gas between the hours of 6 a.m. and 6 p.m. With regard to the other table showing the day consumption per cent. of the total monthly output, he had taken the same period of years. In 1904 the highest and lowest percentages at Yarmouth were 47·89 and 36·33 in December and April respectively; at Felixstowe, they were 47·39 and 41·18 for the same two months. In 1905, the maximum at Yarmouth was in July, 49·81; and the minimum in

March, 35·9. The same months were, peculiarly, the highest and the lowest at Felixstowe; but the figures were 54·73 per cent. for July, and 59·87 per cent. for March. They also topped 50 per cent. in June—viz., 50·88. In 1906, 50·33 was reached at Yarmouth in July as a maximum for the year. The same month was the maximum at Felixstowe—viz., 56·54 per cent., and over 50 per cent. was reached during that year for three other months—viz., 52·69 per cent. for June, 51·59 per cent. for August, and 52·32 per cent. for December. In 1907, over 50 per cent. was reached at Yarmouth in two months—viz., 50·42 per cent. in June, and 50·96 per cent. in July. At Felixstowe, over 50 per cent. was reached in seven of the months—viz., 51·31 per cent. in January; 54·36 per cent. in May; 56·93 per cent. in June; 56·63 per cent. in July; 57·56 per cent. in August; and 52·36 per cent. in December. He thanked Mr. Carpenter for an interesting and fascinating paper. He had given them a lot to think about; and it would be a very useful paper in years to come.

Mr. J. W. Auchterlonie (Cambridge) also thanked Mr. Carpenter for his paper, and congratulated him on the original manner in which he had presented it. With a paper so comprehensive as this, of course, the discussion could be almost unlimited. He took it the discussion would more or less resolve itself round the distribution and sales sections of the paper. In former times, gas managers spent a small part of the day upon distribution work. Now he thought they might with advantage spend more than half the day looking after the interests of the consumers and extending their business. Few concerns could now afford to treat the consumers in the autocratic way that Mr. Carpenter referred to in one part of his paper. The electric metallic filament lamp had increased the competition very considerably; and in spite of the facilities that gas companies had given in the way of hiring-out fires and cookers, and in doing gas fitting free up to a certain point, he thought they were faced with having to give still greater facilities and concessions. Many houses were being erected in which no provision was made for gas-pipes; and in other cases provision was made for only a gas cooker and one or two burners. The question had forced itself upon his mind, as it had upon other minds, as to whether gas companies should not take steps to see that these houses were carcassed free of charge, or at a small charge; because, unless the houses were piped when they were being built, there was little chance of them being piped at all. This was a question upon which he should like to have the opinions of his colleagues, and (if anyone had done this sort of thing) his view as to how far it was found necessary to go. Of course, in the cases that came under the manager's own observation, he could judge each one on its merits as to how far he should go to meet them. But in the cases that were left to inspectors and subordinates, it was quite conceivable that large sums of money might be spent unprofitably. It seemed to him they had now arrived at a position where it was but a short step to the consumer demanding burners and other appliances free. Another question that had been brought forcibly to his mind was as to whether gas companies should not inaugurate some system of free supervision of incandescent burners, radiators, and other appliances which needed regular superintendence. Of course, this enlarged scheme—fitters going round to supervise incandescent burners, &c.—would entail very considerable expense; and he thought that, instead of giving a penny reduction to the consumers, a company's interests would be much better served if they used the penny in some sort of concession, such as this one of looking after the company's interests inside the houses of consumers. It was manifest the British public would not bother about, or take the trouble to look after, their incandescent burners; and he was sure gas companies lost many customers through this indolence, whereas, if they had known (as they would have known if regular attention were given to these matters by the company), they might probably have easily retained them. He fully endorsed Mr. Carpenter's remarks as to the necessity of having educated and properly addressed fitters. There would be a little difficulty in securing the trained, intelligent——

Mr. Carpenter: There is Cambridge. (Laughter.)

Mr. Auchterlonie: No; not even at Cambridge. Could not, he asked, centres be established for the training of their young men. He did not think that many gas companies could independently afford to have lectures delivered by good men (unless undertaken by the engineers themselves) on such topics as water circulation, combustion, and such-like points. But if they could get up a series of lectures at a centre, and send their young men to them, they might by that means get the trained assistance they required. This would do a great deal of good for the gas interests. Mr. Carpenter had paid generous tribute to the work done by the Commercial Sections. He should not like to join issue with him there, as he had himself derived much benefit from the Eastern Commercial Section of their Association.

Mr. J. H. Brearley (Longwood) said he must endorse everything Mr. Auchterlonie had said with respect to the education of the fitters and outside staff; but he was afraid he could not quite agree that they had all the facilities for training young men which the President seemed to indicate, in his address, that they had. He (Mr. Brearley) believed, with the exception of the Leeds University, there was no college or scholastic institution in the country that looked upon gas engineering as a profession. If they took the syllabus of any of the local technical colleges, they would probably find a decent course was marked out for electrical engineering, beginning with mathematics, physics, chemistry, and so on; and leading up to the more complex technics of the subject. They had not got this for the gas industry; and he thought that the gas industry should take some steps to place gas engineering in their scholastic institutions upon a higher plane. In connection with his own pupils, at the beginning of the winter session of the classes, he had to pick out here and there, from the specialized courses of instruction, the subjects he considered most suitable to them as prospective gas engineers. This ought not to be; but the scholastic institutions should have specialized courses for the young men of the gas industry. The Gaslight Company had done something in this direction by arranging with the London County Council for classes which their fittings' pupils could attend, and the Provinces ought to wake up, and see that better provision was also made for them. Perhaps he might be excused if he referred for a moment to the examinations in "Gas Supply" of the City and Guilds of London Institute, which he thought afforded evidence that their young men wanted the means of education Last year, although it was only the second of the examinations on this subject, the number of candidates who presented themselves for examination in gas supply exceeded those in gas engineering; and he did hope that some combined effort would be made to render the facilities for these young men easier in the future than in the past. With respect to one matter in Mr. Carpenter's paper, with reference to the hiring of outside shop lamps, he felt sure every gas engineer would agree with him that it would be very interesting to have a primer on outside shop lamps. The types and variety of appliances and fittings connected with them rendered it a very difficult matter to decide which was the best type of lamp. If Mr. Carpenter could give them his views on the subject, they would be delighted to hear them. He (Mr. Brearley) had been hiring-out shop lamps for some years now; but the difficulty experienced had been that they did not last. In the case of certain lamps put on the market three or four years ago, he found their life was very short indeed; and he knew positively that hundreds of thousands of this type of lamp had been fixed. There was one other matter, in connection with slot-meter collections. Mr. Carpenter changed the collectors from one district to another; and he (Mr. Brearley) thought he was to be commended for the practice. But did he not think that was quite sufficient check upon the collector without giving the consumer a receipt? Many undertakings did not give receipts. Their issue had certain drawbacks, because if slot consumers had receipts, and found they had been doing well for the undertaking during the period, it would have a tendency to cause the exercise of more than ordinary care. Receipts of this kind had their disadvantages from the point of view of the gas undertaking.

Mr. R. G. Shadbolt (Grantham) said he thought it was Mr. Auchterlonie who stated that there was more in the distribution part of the paper than in any other part of it. That was so. If one would only cast his mind back to ten or twelve years ago, he would see what a great change had come over the scene. They would in those times have considered it *infra dig.* to have been discussing the commercial aspect of their business in the way they were doing now. This was the sign of the times. Something had been said—that, too, was by Mr. Auchterlonie—about devoting something like 1d. per 1000 cubic feet to cultivating the consumers and to looking after their requirements generally. They had at Grantham been looking after their consumers to the utmost of their ability; and their own fittings account came out to about the figure mentioned by Mr. Auchterlonie. Their first loss, including the little services to the consumers for which no charge was made in connection with fittings, including maintenance, amounted to 0·81d. per 1000 cubic feet of gas sold. In addition to that, as assisting the distribution department, there was the depreciation on cookers, fires, and so on (over and above the ordinary amount received as rent), which was equal to 2·83d. So that in these two items they had upwards of 3d. per 1000 cubic feet loss in rendering service to the consumers, in depreciation, and in other things. That was the direction in which they were being forced. Without going to any extent into details—that was, comparing point by point—he thought that most of them would run up against Mr. Carpenter with reference to his collection of the slot-meters, more particularly with regard to the frequency of the collection he advocated. It seemed to him (Mr. Shadbolt) wasteful to keep men running round every fortnight to these meters. Taking the cost per £1 collected. Whereas at Grantham, they collected £1 15s. 6d. per annum per meter, against £2 10s. at Yarmouth, it cost them with a bi-monthly collection, and there were no robberies, 3·7d. per £1 collected, against 6·1d. at Yarmouth. Mr. Carpenter was literally throwing away 2·4d., or £73 a year, or 65 per cent. more than the cost ought to be, if the bi-monthly system was in vogue. That, in his opinion, did not show economy; but no doubt in the system of collection, local conditions were a ruling factor. He could not help saying that he had noted the ingenious manner in which Mr. Carpenter had accounted for the increased number of so-called complaints. In this regard they were even bigger sinners at Grantham than they were at Yarmouth. Mr. Carpenter's complaints numbered 13·9 per cent. per annum of the number of consumers. The author of the paper attributed this to the greater attention paid to the consumers. If this was an indication that the gas authorities at Yarmouth were attending to their consumers more assiduously than they used to do, what would be thought when he told the members that the Grantham figure was 53·3 per cent. against the Yarmouth 13·9? When he added that absolute orders for work to be done amounted to 91·6 per cent., and that what used to be known as the complaint book had now grown into the request

and general complaint book, and that it contained 145 per cent. of total orders, complaints, and requests from the total number of the consumers, he thought it would be agreed that, from the way in which Mr. Carpenter had put the case, at Grantham they certainly attended to their consumers exceptionally well indeed. [Laughter.] What they had been accustomed to call complaints had, to a large extent, expanded into attending to consumers' requirements. And it was an eye-opener as to the innumerable requirements of their consumers. With regard to the maintenance of incandescent burners, that would, of course, depend upon what was done. At Grantham they maintained the burners of about 50 per cent. of the number of private consumers, which was equal to 21·6 per cent. of the incandescent burners in use. Something on the lines that Mr. Helps, of Croydon, and others were doing—that was to say, free inspection and a cost-price charge for the material used—was what unquestionably they were drifting to. As to coke sales, what was now being done in this direction was largely the outcome of the Commercial Sections. Of course, in this matter local conditions must come into play. Whereas Mr. Carpenter found he had run up his broken coke sales to 14 per cent., he (Mr. Shadbolt) had run his up to 33 per cent., of which the Grantham total was 27 per cent., and outside 6 per cent. There were other works that had developed their domestic broken coke sales to a similar extent. Summing up the paper generally, Mr. Carpenter had lucidly summarized for them the effect of the increasing demand brought about by the extended use of cookers and various other kinds of appliances, and its effect upon the general management and output—more particularly when the comparison was made on annual output. The question that presented itself to his (Mr. Shadbolt's) mind, and to that of others, was what, after all, was the net result upon their operations as gas manufacturers and suppliers of all this striving after little economies; and if this work did inflict a little loss what was the net result? It appealed to him in this way, that the great result over the whole of the operations was that the capacity of the generating plant and distributing plant was materially increased by this levelling-up of the load—by bringing up the day consumption, and so increasing the consumer's total consumption. In his own case, he found that twelve years ago, comparing the maximum week's output with the minimum week's output, the maximum week's output was 4·15 times the minimum week; whereas at the present time it was only 1·96. The effect of this upon the year's output was that, in his own case, if they took it on the maximum day's capacity as compared with the annual output, it would be found that the total plant had increased in capacity by over 18 per cent. in the twelve years, or on the maximum day's capacity by 21·66 per cent. on the year's total producing capacity. The capacity of the distribution plant had been increased by no less than 20 per cent. This then was the economy of this work on production and distribution; and it was a mutual benefit both to producer and consumer.

Mr. George Helps (Nuneaton) said that some seven or eight years ago they undertook the free carcassing of houses at Nuneaton, and gave it up because it did not pay. His experience was that, keen as the electric light competition was in his town, people would not use gas any the more though piping was given free. With regard to the supervision of burners, he was quite in accord with what Mr. Auchterlonie had said. He thought there would be few present who would not agree that free maintenance of burners was to come, and come shortly. Their experience at Nuneaton with a large number of slot consumers was that, if the Company did not maintain the burners, gas would not be consumed. Some of those present would recollect the paper he read about nine years ago on the disadvantages of the slot business. Those disadvantages were, of course, attributable to the low consumption per consumer at Nuneaton—then only about 6000 cubic feet, though they were putting in any number of burners wanted, and a cooker costing £4 10s. Some of the members then disagreed with him. Perhaps that was because he did not put his points before them in the manner he should have done. They had now in operation a system of semi-maintenance—not entire maintenance—of the slot consumers' fittings; and this had put up the consumption to nearly 9000 cubic feet per consumer.

Mr. T. Shadbolt (Kirkby-in-Ashfield) said there was one point in the paper that appealed specially to him—that was, the slot-meter collection; and for this reason, that he had four slot meters for every one ordinary meter in use. The slot-meter system was therefore to him a very big thing. At the outset, he would like to confirm, from his point of view, what their friend Mr. Brearley, had said with regard to the giving of receipts. He commenced the system by giving receipts; but after the experience had proceeded twelve months, he found that the giving of receipts entailed more disadvantages than one, and so he was anxious to discontinue the system. His co-officials under the Council said the Local Government Board auditors would not permit him to do this; and this would be an insurmountable difficulty. But he went at once to the Local Government Board auditor, and got his permission. He had found that not giving receipts was the cheapest system of collection; and he had had ample proof of the fact that, in respect of the amount of the consumption, "where ignorance is bliss, 'tis folly to be wise." [Laughter.] As to the figures of cost, Mr. Carpenter had invited discussion by comparison; but he thought comparison was difficult. There were a great many factors that entered into the case. Wages, for instance. He had himself to pay the union standard of wages. Consequently, his men were very well paid for the work they did. Although Mr. Carpenter might beat him on the figure, he could beat him on the figure. This might sound paradoxical. He admitted that it all rested on how many collections they made in the course of the year. In his case, they had four only. He suggested that the more correct way of comparing would be to base the price on the cost per visit per meter. His cost per collection came to 3·52d. per year per meter, on Mr. Carpenter's basis—that was slightly under 1d. per meter per visit. Mr. Carpenter's figure was a little further under 1d. per meter per visit; but his total cost was 1s. 3d. a year per meter, against his (Mr. Shadbolt's) 3·52d. He (Mr. Shadbolt) did not lose 1s. a year by robbery. In some cases, it might be worth while to spend so much money; but, in other cases, it would not be. It was all a question of local conditions.

Mr. Thomas Glover (Norwich) said he only wished to express his appreciation of the paper, and to emphasize one point—that was, that they could congratulate Mr. Carpenter for instituting the comparison between day and night consumption. He (Mr. Glover) thought Mr. Carpenter was the originator of this comparison; and perhaps sufficient acknowledgment had not been made of the fact, because he thought is was going to be of great value to the gas industry in the future. Like others, he was not in agreement with every one of Mr. Carpenter's methods. He quite appreciated all that had been done at Yarmouth to increase consumption, and to cheapen gas in the production; but he did not agree with the method of slot-meter collection. Some of them probably had heard the tale of the negro, who, when told that the sun never set on the British Empire, said, "What a dishonest people these Britishers must be, if they cannot be trusted in the dark." The Yarmouth people must be very dishonest if collections from their meters had to be made every fortnight. He ventured to say this cost more than it was worth. If they applied the same system at Norwich (where each slot collector looked after some 3000 meters in place of only 1000 at Yarmouth), if they were to increase their collection so as to make it proportional with Yarmouth, it would cost them £1000 a year. He did not now lose that much by robberies.

The President remarked that they all seemed to have this slot collection very much in their minds. Of course, circumstances must influence each manager in his ideas as to how to conduct his business. In Hull, they had some 20,000 slot meters; and they collected them once a quarter. The loss by robbery last year was under £15. Now if he had to collect twice a quarter, it would cost him £400 per annum to try and save £15. Mr. Carpenter in Yarmouth found it was necessary or beneficial to collect the money from his meters very often. It was difficult to make any comparisons of that kind. He quite agreed with Mr. Auchterlonie and Mr. Brearley that trained assistants for inspection of fittings were difficult to get, but they were coming. It was quite true that the technical colleges of the country had not issued syllabuses such as Mr. Brearley had indicated, but evening classes in gas supply and gas engineering were well attended. In Hull they had such classes; and to his own fitters, and the young people about the works, he offered prizes to each one who gained an ordinary pass or honours certificate in the first or second class. Each one had a prize in accordance with his merit; and if a student put in a sufficient number of attendances during the session—thus showing that he was interested in his business—he (Mr. Young) paid his fees. The result was they were getting a more educated and more intelligent class of young fellows growing up around them, and inspection and maintenance duties were being better fulfilled. There was no doubt that inspection was coming along with rapid strides; and they would have to educate their young people into an intelligent understanding of all the pieces of apparatus they had to handle and attend to in the consumers' houses if they wished to ensure success. He desired to compliment Mr. Carpenter upon his paper. It must have been a tremendous labour to compile the statistics he had given; but it would be useful to them in finding out all the small details where they could save money for their companies or corporations as the case might be, and so supply gas at the cheapest rate to their consumers.

Mr. Carpenter, in replying to the discussion, said Mr. Paternoster's experience seemed to be more or less the same as their own with regard to slot meter consumers. He only collected ¾d. more than they did at Yarmouth. Respecting the other question about salt water and naphthalene. They thought—in fact, they were sure—when they got what he described as the "briny element" and the temperature was lower they had more trouble. As the members knew, the naphthalene would comb out at rather a lower temperature than at a higher one. They were not much annoyed with naphthalene just now, because they were not troubled so much with the briny element; they had been getting too much of the other this summer, so that the roads did not require watering so frequently with salt water. Mr. Paternoster had mentioned coke in connection with the table in the paper. That, as they all knew who were in the commercial sections, was essentially a local question. He had brought forward what he thought were his top figures, and was glad Mr. Paternoster had taken the trouble to compare them. But when he (Mr. Carpenter) wrote the paper, it was not to show particularly what they had done at Yarmouth, so much as to state what had been done in order to give an opportunity for comparison. And therefore he had had a great deal of pleasure in hearing all that had been said. The point as to slot-meter collection and receipts had been emphasized. Some of the members said that it was not

necessary to give a receipt, but to simply collect the money. At Yarmouth, they held a different view. No bargain was good unless it was satisfactory to both parties. Every one was entitled to a receipt when they paid for anything. Therefore they gave their slot consumers a receipt; and he thought it was due to them, when they asked for a receipt, that they should have it. He did not think from his experience that the consumers burned less gas because they knew what they had consumed. He thought the consumers derived satisfaction in knowing that they were exercising a certain amount of economy; and this had a good effect. It was generally found that, if they had a bad consumer, he was not a profitable one. The best consumer was the one who was contented. As to Mr. Brearley's remarks, there were no technical schools for fitters at Yarmouth; but at the same time he did not see why each company should not institute an educational system of their own. At Yarmouth they had instituted the system of apprenticeship. By such a system, if they put the boys with a good man, they were teaching them something they could not get at Cambridge. [Laughter.] He thought that, in this matter, they could individually help things considerably. He did not say they could deal with the ordinary gas-fitter. The ordinary gas-fitter was a most difficult man to deal with. But, after all, he did not see why they should not try to get their technical schools to have gas-fitting classes, similar to those for plumbing. If they could provide plumbing classes, why not gas-fitting ones? The further gas undertakings got into the question of free inspection and maintenance, the more gas-fitters would be required. This was a matter, however, that each manager must deal with in his own sphere; and each one must see what could be done to push it forward. Regarding outside shop lighting, they had done a great deal of this at Yarmouth. In fact, they did not stop at anything. If they found that these outside shop lamps wore out, then his advice was, "Scrap them, and get some more." He found that their electrical friends were everlastingly doing the same thing. They did not tell the Gas Company what they were doing; and the Gas Company did not say anything, but the officials thought a tremendous lot, and acted as they considered best. They were doing a great deal; but they did not publicly recognize the fact. [Laughter.] No one could be more emphatic than he in regard to distribution. They had not heard the last word about it. They would no doubt be meeting at some future time talking about distribution in other new lights; and there would be a discussion equally good to that they had had that day. All he hoped was that some little profit would result to others from his paper. For the appreciation concerning it that had been expressed, he was deeply thankful.

STEEL TUBES FOR DISTRIBUTION IN HOLLAND.

A few days ago, the Association of Directors of Water-Works in the Netherlands held their annual meeting at Nymegen. About 70 members were present, and they inspected the new pumping-station and electricity works erected by Heer Van Spall for the Municipality of Nymegen. The electricity, which is to compete with the established gas supply of the town, is to have a day-load at the pumping-station; and in this respect the scheme is somewhat novel. There was a fine installation of centrifugal pumps driven by electric motors. Later on there will no doubt be added also the electrification of the existing steam tramways. In Holland there are upwards of 100 miles of Mannesmann steel tubes in use for gas and water; three water companies using them exclusively. Consequently, the matter of service connections has been exercising Dutch engineers; and at the meeting a demonstration was given of the Woodall-Parkinson expansion nipple by a representative of Messrs. J. Stone and Co., Limited, of Deptford. A 6-inch steel tube was rigged up on trestles at the water-works, one or two tappings made, and nipples expanded and joints made in the way which is now familiar in this country. Then the water was turned on (about 100 lbs. pressure), and a tapping made under pressure with Stone's Morris machine, which also inserted the nipple and mandrel. The expansion of the nipple under pressure by withdrawing the mandrel through the specially designed plug-ferrule was operated without any loss of water. The President of the Association thanked Messrs. Stone for the trouble they had taken in preparing the demonstration.

The "Engineer" learns that a gas-driven street-car is now under construction in Philadelphia, which is to be tested on the line of the Metropolitan Street Railway Company of New York in competition with the electric cars of the Company. It will be driven by two four-cylinder motors, each of 24 H.P. These will be water-cooled, and piping will be led from the motor-jackets round the interior of the car so as to heat the latter during winter service.

A bronze statue of the late Colonel S. B. Bevington, who was the first Mayor of Bermondsey, is to be erected in the Tower Bridge Road, opposite the new technical college now being built by the Leathersellers' Company. It will be a full-sized representation of Colonel Bevington in his mayoral robes, and, with the stone pedestal, will be 10 feet high. The artist whose work has been accepted is Mr. Sydney March, of Globe Place, Chelsea, who, it may be remembered, designed the bust and pedestal of the Livesey Memorial, as well as the alcove in which the memorial stands, at the works of the South Suburban Gas Company.

WHAT QUALITY OF GAS IS CALLED FOR?

By Dr. H. Bunte, Professor at Carlsruhe Technical College.

The lecture dealing with this question delivered at the meeting of the German Association of Gas and Water Engineers at Frankfort-on-the-Maine in June last by Professor H. Bunte, the General Secretary of the Association, has now been published (with some added matter) in the form of a communication to the "Journal für Gasbeleuchtung." We give below a summary of its contents, with particular reference to the points not dealt with in the general report of the proceedings at the meeting, as published in the "Journal" at the time (Vol. CVI., p. 968).

There was presented at the first meeting of the German Gas and Water Association in 1859 a paper dealing with a generally applicable mode of judging the quality of gas; and having regard to the great changes in methods of manufacture, and more particularly in the manner of use of gas which have taken place in the last decade, it seems appropriate at the Jubilee Meeting of the Association to reconsider the subject which was thus debated at its first meeting. It would be interesting to trace the history of the topic from that date to the present time, and to discuss its probable developments in the future; but except so far as a few references to past experiences are concerned, the author has deemed it prudent and necessary to confine his treatment of the subject to the present.

It is unnecessary to look beyond Frankfort-on-the-Maine for proof of the fact that requirements in regard to the quality of the gas are extremely diverse, even in the same place and at the same period. For many years past there have been in this city competitive supplies of poor and rich gas to meet the needs of the people for a gaseous fuel for lighting, heating, and development of power. At one time, too, the quality of gas was sufficiently indicated by prefixing the name of the material from which it was produced—as coal gas, wood gas, oil gas, &c. Then simple photometers were introduced. The bunsen grease-spot photometer possessed the same pleasing simplicity as the bunsen burner, which its inventor devised about the same time. The illuminating power of the gas thus became the most important criterion regarding its quality; the standard of measurement being in early days the spermaceti candle, which was then in actual use in the best houses in England for illuminating purposes. In Germany, wax, stearine, or paraffin candles were frequently used as standards. For the last 25 years, the Hefner lamp has been in general use, and has attained international recognition as a simple, readily reproducible, and constant standard for the determination of the intensity of light.

The improvement of the standard of light, however, only solved satisfactorily one part of the whole problem—viz., the measurement of light. It did not afford a sure criterion of the quality of the gas, since a very different illuminating power or intensity of light could be obtained from the same quantity of gas by varying the conditions of combustion, such as the design of the burner, the pressure of the gas, and the regulation of the air supply. At the present time, a burner—viz., the "Carpenter"—is prescribed in England for the photometry of gas, which cannot be used for practical lighting, but which, through the regulation of the air supply, gives a flame of 16-candle power with gas from which in the flat-flame or the ordinary argand burner only 8 or 10 candles would be obtained. Thus the conditions of combustion have great influence apart from the quality of the gas; and photometric testings therefore afford merely a comparative, and in no sense an absolute, measure of the character of the gas. There has been no lack of proposals to determine the quality of gas in other ways, such as by the estimation of the proportion of so-called "illuminants" by absorption by bromine, or by measurement of the proportion of air required to make a gas-flame absolutely non-illuminating. But these proposals were passed over, and photometric testings sufficed as long as the gas was used almost wholly for lighting in flat-flame and argand burners.

The introduction of the Welsbach burner, and the increasing use of gas for heating purposes, rendered the old photometric method of testing the quality of gas entirely purposeless, because in certain conditions a gas would give a better lighting duty in the incandescent burner than another gas which by the old method of testing would be returned as of better quality. The necessity for a practical method of assessing the quality of gas in the new conditions was recognized in the appointment, at the International Gas Congress held in Paris, of an International Photometric Committee, who had their first session at Zürich, in 1903. On that occasion, M. Sainte-Claire Deville proposed to assess the quality of gas according to its calorific power. He showed that there was a close correlation between the heat of combustion of gas and its illuminating power when consumed in the incandescent burner, and that within certain limits the illuminating power was proportional to the calorific power of the gas. While this proposition is supported by certain theoretical considerations, it is antagonistic to others; and with a view to proving its correctness, the author has had a number of researches carried out in recent years in his laboratory on the relation between the calorific power of gas and its illuminating power in the incandescent burner. The results of these researches have been reported in a communication by Dr. M. Mayer and Herr A. Schmied, who, in conjunction with Dr. Stöcker and Herr Rothenbach, carried them out. It need

only be said now that these investigations were made on mixtures of coal gas with from 10 to 75 per cent. of hydrogen, or from 15 to 60 per cent. of carbonic oxide, and that the calorific power of the mixtures ranged from about 360 to about 590 B.Th.U. per cubic foot. The gases were consumed in turn in the same incandescent burner, in the same conditions, with the theoretically required proportion of air added in the bunsen burner. Thus the highest temperature and maximum illuminating power were attained, so that the values are strictly comparable. The results of the investigations are shown graphically in figs. 1 and 2, in which the abscissæ refer to the amount of heat supplied to the burner in unit time, and the ordinates the number of Hefner units found by the photometer. If the illuminating power developed in the incandescent burner were exactly proportional to the calorific power of the gas, the curve for each sample of gas would

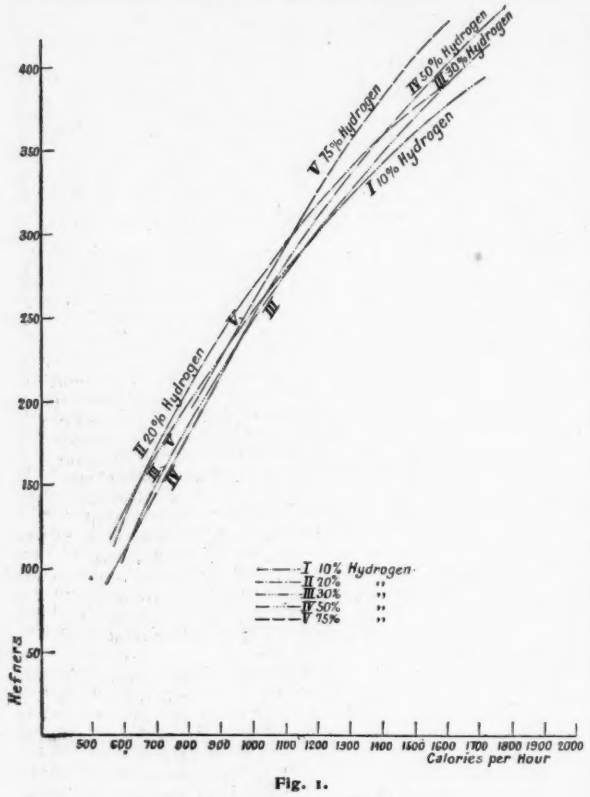


Fig. 1.

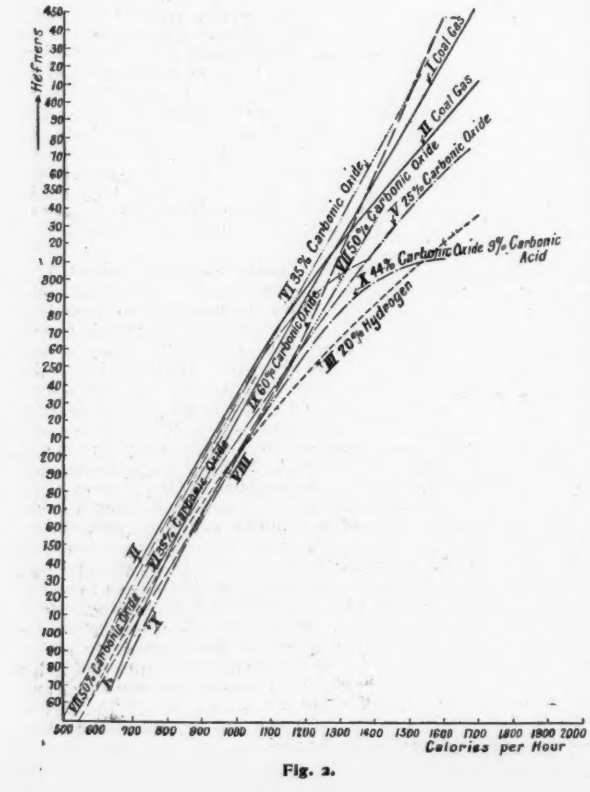

Hefners
I Coal Gas
II Coal Gas
V 25% Carbonic Oxide
III 20% Hydrogen
500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
Calories per Hour

Fig. 2.

be a straight line. It will be seen that the curves are in fact nearly straight lines. Complete agreement cannot be expected owing to unavoidable errors of experiment, changes in the mantle, and the adaptation of the burner to consume at one time three times as much gas as at another.

If the gases were all of equal value relatively to their calorific power, the curves theoretically should all be identical. That they are slightly divergent is not surprising, having regard to the wide differences in the composition of the gases and to the experimental difficulties. But it is evident that the curves must in the circumstances be regarded as lying very close together. On the other hand, it may seem surprising that gases of such widely different descriptions should behave so much alike. The explanation is afforded by the fact that even the most different gases yield the same products of combustion—carbonic acid and water vapour diluted with large quantities of atmospheric nitrogen—and that the theoretical limit of temperature in the extreme cases of the samples of gas investigated ranges only from 1923° to 2033° C. Other influences, dependent on the nature of the constituents of the gases—such as size and shape of flame, dissociation ratios, &c.—naturally also affect the result. But the influence of the calorific power of the gas is paramount; and hence the following practical rule may be accepted for stating the quality of gas. The illuminating power of the incandescent gas-burner is *cæteris paribus* nearly proportional to the amount of heat supplied in unit time, and, consequently, to the calorific power of the gas. That is to say, to produce the same light in the Welsbach burner, in the same conditions, about 25 per cent. more must be consumed of a gas of 400 B.Th.U. per cubic foot than of a gas of 500 B.Th.U. per cubic foot.

The fact enunciated in the foregoing rule indicates that the calorific power affords a standard of measurement of unsurpassable reliability for the assessment of the quality of gas. The same could not be affirmed of the determination of illuminating power by the old photometric method. Moreover, the calorific power is the only criterion by which the value of gas may be judged for all its domestic and industrial applications other than lighting—such as for cooking, heating, and the supply of gas-engines. The calorific power expresses exactly the amount of energy in the gas, which energy may be applied at will for lighting, heating, or development of power. Moreover, the calorific power or heat of combustion is an absolute measure or scale of value, which is independent of the method of combustion, of any apparatus, and of all other conditions of combustion. Whether the gas is burnt in air or in neat oxygen, the same calorific power will be obtained for a particular gas with any practical instrument constructed on scientific principles. Calorific power therefore affords that generally applicable measure or standard for the assessment of the quality of gas which was spoken of at the first meeting of the German Association in 1859. The old photometric tests of gas-flames, with all their errors, may therefore be entirely dispensed with. The determination of calorific power, moreover, has yet another important advantage over photometric testing in that it can be made wholly independent of the personal element, quite automatic, and as a continuous record. [There are quite practical self-recording calorimeters based on scientific principles in existence.] In photometry, on the other hand, the personal collaboration of a trained observer is a necessity.

The next point is: What ought to be the calorific power of the gas? Different views may be held in regard to this question, according to time and circumstances. Two years ago, at the meeting of the German Association at Mannheim ["JOURNAL," Vol. XCVIII., p. 810], the author advanced the opinion that gas should not fall below 5000 calories per cubic metre at 0° C. and 760 mm. gross calorific power—522 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated. He did not intend thereby to set up a definite standard, but rather to avoid abuse, perhaps unintentional, of the freedom which the introduction of the incandescent burner has afforded in regard to the quality of gas. Meantime, no objection has been raised to that limit. If, however, it is taken as a minimum value, below which the gas must not fall, a somewhat higher figure will have to be observed in normal working—say, 5200 calories per cubic metre—543 B.Th.U. gross per cubic foot at 60° Fahr., 30 inches, and saturated—which is the standard observed in the Municipal Gas-Works at Berlin. This would afford latitude for unforeseen changes in working, whether of the coal or of the operations on the gas-works. It is, however, of great importance that there should be as small fluctuations as possible in the quality and pressure of the gas supplied, as the air supply to the bunsens, whether of modern incandescent burners or of cooking or heating burners, depends thereon. Fluctuations affect the efficiencies of the burners, and may lead to great inconvenience through the striking-back of the flames. Apparently fluctuations of 100 calories (say, 10½ B.Th.U. per cubic foot) above and below do not cause appreciable disturbance of the working of the burners, and in many cases even greater fluctuations are tolerated.

If the effect on its value is considered of the individual constituents of the gas, apart from hydrogen, methane, and heavy hydrocarbons, it will be found that, owing to the universal use of the bunsen burner in some form for every purpose of lighting and heating, a great simplification of the conditions has really ensued. When flat-flame and argand burners were used, the proportion of carbonic acid in the gas was of great importance, as this gas caused the carbon in the flame to be consumed to carbonic oxide, which burns with a blue flame, and thereby greatly diminished the light

produced. Hence the carbonic acid had in most cases either to be removed at great expense and inconvenience, or the required illuminating power had to be maintained by the use of enriching agents. For the present use of gas in the Welsbach burner, however, the carbonic acid is of little importance, as it acts mainly as a diluent. It should be remembered that before the gas reaches the mantle it is burnt in the inner cone of the flame to a mixture of carbonic acid and carbonic oxide, water vapour, and hydrogen, and so becomes a water gas diluted with much nitrogen. This is burnt completely when it reaches the outer cone of the flame. The same applies generally to air, oxygen, or nitrogen in the gas. The old flat-flame was very injuriously affected by them just as by carbonic acid; but in the incandescent burner a great deal of air is purposely introduced into the bunsen, and a small proportion of air in the gas has therefore no directly harmful effect. It merely dilutes the heating constituents, and thereby reduces the value of the gas. The gas must, however, in all circumstances have as nearly as possible the same composition, as modern more refined lighting and heating appliances, and the inverted burner in particular, are much more sensitive to variations in composition of the gas than the old open-flame burners. If coal gas only is supplied, its composition is affected more by the conditions of carbonization than by the particular coal used—provided it is a gas coal. But if either simple or carburetted water gas is added to the coal gas, great fluctuations in composition may result, and care must be taken in regard thereto, especially in small gas-works; otherwise great trouble may ensue from the firing-back of consumers' burners, particularly cooking appliances. A number of devices have lately been put on the market for testing gas with the object of ascertaining the proportion of air it requires for its combustion. These are based on the same idea as the old gas-tester of Erdmann, which thus receives due recognition.

A few words may be said regarding the use of coke-oven gas for town supplies. According to the author's observations, it is possible, by careful management of the plant and supervision of the working, to obtain from coke-ovens a gas which is of exactly the same value as the coal gas of gas-works, and is quite satisfactory in regard to uniformity of calorific power and of composition. The author is therefore convinced that the surplus coke-oven gas resulting from properly-installed regenerative coke-ovens will yet play an important part in the supply of the population of industrial districts with gaseous fuel. The attention of gas-works in such districts may be again directed to this question.

Sulphuretted hydrogen is the chief of the impurities which are separated from the crude gas by the purifying plant of gas-works. A century ago Clegg effected its complete removal by means of lime; now it is easily removed almost universally by oxide of iron. Hence gas wholly free from sulphuretted hydrogen has for years been demanded and supplied. In regard to the traces of other sulphur compounds—chiefly carbon bisulphide—no practically applicable process has even yet been found for the complete absorption of them in the extremely small amounts in which for the most part they occur in gas. Nevertheless, success in the efforts being made to discover such a process would be welcome, as many objectionable occurrences, in connection with heating by gas in particular, could thus be overcome, and many otherwise suitable coals which have hitherto not been used on gas-works, on account of their richness in sulphur, could then be utilized. From the hygienic standpoint, there has been no objection raised in Germany to these compounds. On the other hand, authorities on hygiene in that country have repeatedly drawn attention to the increase in the proportion of carbonic oxide caused by the extended admixture of water gas with coal gas, and limits have been proposed for the amount of water gas which may be used. As carbonic oxide is the poisonous constituent of illuminating gas, it would certainly be desirable to remove it completely from the gas; but there is no practically available works' process for effecting its removal. It may be pointed out, however, by way of suppressing exaggerated fears in regard to it, that upwards of 36 to 40 per cent. of carbonic oxide is contained in wood gas, of which the manufacture was considerably improved by that great authority on hygiene, Pettenkofer. On his recommendation, wood gas was introduced about the middle of last century into many towns in South Germany far distant from the coalfields; and it was only with the improved facilities of transport for coal and the increasing cost of wood that this wood gas was ultimately supplanted by coal gas. For several decades the towns were supplied with wood gas rich in carbonic oxide, and, indeed, only a few years ago the bathing resort of Reichenhall converted its gas-works for the supply of coal gas in place of wood gas. This was the last of the wood-gas works of South Germany; and the conversion was made on economical, not on hygienic, grounds.

Of the other impurities of crude coal gas, ammonia and cyanogen are removed as completely as possible by gas-works in their own interest, as they constitute valuable bye-products, the means for the recovery of which have of late years undergone great improvement. In regard to the removal of these impurities and of naphthalene, the financial interests of the gas-works are incentives superior to any prescriptions. In this connection, it may be mentioned that at a conference of gas-works chemists, which was held at Carlsruhe in May last at the instance of the Council of the German Association, and in which about forty chemists participated, the question of the quality of gas which was now called for was discussed. Although the proceedings were not public, it may be mentioned without breach of confidence that there was general agreement on the following points in regard to the quality of gas required at the present time: 1. A gross calorific power of 5200 calories per cubic metre at 0° C. and 760 mm. (543 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated) is recommended for adoption as a standard. The calorific power should fluctuate as little as possible, and should not fall below 5000 calories per cubic metre (522 B.Th.U. per cubic foot at 60° Fahr. and 30 inches). 2. Tests of illuminating power are superfluous in the present position in regard to the use of gas. 3. A proportion of 25 per cent. of carbonic oxide is permissible in mixed gas. 4. The gas must always be wholly free from sulphuretted hydrogen. There is at the present time no technically applicable process for the removal of the other sulphur compounds which are retained in small quantities in the crude gas. No maximum limit can, therefore, be fixed for their amount. 5. Special tests for enforcing restrictions on the amounts of ammonia, cyanogen, naphthalene, carbonic acid, oxygen, and nitrogen in purified gas, or in regard to its specific gravity, are considered unnecessary.

The most important of these conclusions are comprised under the headings 1 and 2. The grounds on which they are based from the point of view of the users of gas have been sufficiently indicated; but a few remarks may now be made from the gas manufacturer's standpoint. In the first place, if the quality of gas is no longer to be assessed according to its illuminating power, but according to its calorific value, valuation of coals for gas making is put upon an entirely different basis. The "sperm value" of a gas coal, which varied according to the conditions of carbonization, owing to the extreme sensitiveness of the illuminating hydrocarbons to exposure to high temperatures, becomes of no significance. It is true that the conditions of carbonization affect also the calorific power of the gas produced, but in a much smaller degree. Moreover, calorific power serves as the basis of valuation of both the coal used and of the gas made. Hence those coals will be preferred for gas making which admit of the largest proportion of their heating value being transferred by distillation into the form of gas. To take an example, if a coal possesses a calorific power of (say) 14,000 B.Th.U. per pound of dry ash-free coal substance contained in it, and on carbonization yields 3500 B.Th.U. per pound in the form of gas, or 25 per cent. of its original heating value, it should be preferred, *cæteris paribus*, to another coal which only yields 20 per cent. of its heating power in the form of gas. There are, of course, other considerations which also affect the choice of coal—such as the quality and quantity of the bye-products. Most important of these are the quantity and quality of the coke, ammonia, and tar produced, and the more or less rapid rate at which the coal gives off its gas. But the principal determining consideration must always be the quantity and quality—*i.e.*, calorific power—of the gas produced. The results of investigations made on a number of typical German coals at the experimental works of the Association at Carlsruhe have been summarized from this standpoint (*vide* "JOURNAL," July 27, p. 236). The distribution of the calorific value of the coal among the several products of its distillation—coke, gas, and tar—has been shown in the report of those investigations. It appears therefrom that from 21 to 29 per cent. of the heating value of different coals is recoverable in the form of gas. This factor is primarily the most important at the present time in settling the choice of gas coals, though other considerations must, as already mentioned, not be disregarded. Bearing in mind the change in the standard or conditions of assessment of the value of gas coals which has been brought about by the passing away of the illuminating power test and the altered methods of carbonization, it appears that the class of gas coals will be considerably extended so as to include descriptions which have hitherto not been regarded as falling within it. In vertical retorts and large chamber ovens, usable coke and gas of standard quality can be obtained from varieties of coal which could not be used in the old types of retort-settings. Investigations at the experimental works of the German Association will be directed to comparing the coals commonly used in German gas-works with a view to throwing further light on this matter.

At the conclusion of Professor Bunte's address, Professor H. Strache, of Vienna, made some lengthy remarks deprecating the acceptance at the present stage of any minimum limit of calorific power by the gas industry. These remarks have already been reported pretty fully in the "JOURNAL" (*vide* Vol. CVI., p. 968). Professor Bunte, in acknowledging them stated that his views did not really conflict with those of Professor Strache, who had only extended them somewhat in regard to the application of water gas. He (Professor Bunte) had expressly excluded the future developments, which Professor Strache had in mind, from consideration; and it was not his wish to fetter the industry in regard to the quality of gas to be supplied. The propositions put forward were intended only to serve as a basis from which deviations upwards or downwards could be sanctioned, according to the circumstances. But caution should be exercised in assessing gas otherwise than according to its calorific power, and in claiming special advantages for the poorer qualities, even though they gave a comparatively good duty with the burners at present in common use. In regard to the relation subsisting between calorific power and illuminating power in the incandescent gas-burner, it was not pretended that this relation took the form of a definite law. It presented only a very useful rule, which might be of service just as Dulong's rule for ascertaining the calorific power of coals had been of great use before any practically available calorimeter had been devised.

GASEOUS EXPLOSIONS.

Second Report of the British Association Committee.

(*Concluded from* p. 768.)

III.—Explosion Experiments.

Much light has been thrown on the chemical processes in such explosions as occur in the gas-engine by a very complete study made by Dr. Watson of the thermal and combustion efficiency in a petrol motor.* Such a motor, on account of its high speed, is well suited for the investigation of this question. In some of Dr. Watson's experiments, as little as 1-50th of a second elapsed between the ignition of the mixture of petrol and air and the discharge of exhaust gases. The most important part of Watson's work, from the point of view of the Committee, is the simultaneous measurement which he has made of the quantities of air and of petrol taken into the engine and of the chemical composition of the exhaust gases.

Several observers have found that even when the combustion in the petrol-engine is apparently perfect, there being some excess of oxygen and no carbon monoxide or hydrogen in the exhaust, the ratio of hydrogen to carbon in the exhaust gases is considerably greater than in the petrol used—showing that even in this case there must be some incomplete combustion.† The very complete set of analyses taken by Dr. Watson (of which he was good enough to give full particulars to the Committee in Note No. 7, before his paper was published) bear out this observation, and show that the discrepancy between the composition of the exhaust gases determined in this way and that of the petrol is not due to errors of experiment.

Some evidence as to the cause of the discrepancy is furnished by the experiments of Hopkinson, who found that by exploding the residue of the exhaust, after absorbing carbon monoxide and hydrogen, with electrolytic gas, a considerable further yield of carbon dioxide, amounting to nearly 5 per cent., was obtained. Hopkinson also found that the residual combustible gas revealed in this way was soluble in water, which points to the possibility that it may be an aldehyde, or possibly acetylene. It is known that in the combustion of hydrocarbons, such as petrol, with insufficient oxygen, considerable quantities of aldehyde are formed; but, so far as the Committee are aware, the question has not been fully investigated where sufficient oxygen is present to burn the petrol. It is at least possible that the effect may be due to deficient vaporization or incomplete mixture in the combustion as it occurs in the petrol engine, and that it would not happen if the petrol were completely converted into vapour, and that vapour sufficiently intimately mixed with the air before combustion took place. Professor Bone, however, considers that the combustion of a hydrocarbon with insufficient oxygen is not different as to chemical actions from combustion with excess oxygen; and he dissents from the view that the effect observed may be due to deficient vaporization or incomplete mixture. The question is one well worthy of the attention of those chemists who are engaged in the study of the combustion of hydrocarbons. Whatever the explanation, the practical result established by these experiments of Watson and Hopkinson is that the petrol is rarely, if ever, completely burnt in a motor fed by the ordinary types of carburettor, even when there is apparently considerable excess of oxygen.

Neither Watson's nor Hopkinson's experiments, which are in full agreement with one another, suggest that the incomplete combustion occurring in the petrol motor is conditioned in any way by the speed of revolution. It is probable, therefore, that it is not incomplete combustion of the kind contemplated by the Committee and referred to in their first report, such as may be caused by the action of the cold walls of an explosion vessel in which a truly homogeneous mixture is exploded.‡

Some light is thrown on this question by some experiments made by Dugald Clerk during the year under review, who has exploded mixtures of coal gas and air in an apparatus consisting of a cylinder containing a piston which could overrun a port at the end of the stroke. The cylinder was charged with a mixture of gas and air; the piston being placed so that the port was closed, and sufficient time was allowed for complete diffusion to take place. The mixture which was at atmospheric pressure and temperature was then fired, the pressure generated forced out the piston, which opened the port at a period varying from 0·11 to 0·23 second from the moment of explosion; thus liberating the gases. The gases escaped through the port and through a passage packed with cold wire gauze by way of a small slide-valve into a collapsed gas-bag. The gauze checked any chemical action going on in the gases, which were subsequenlly removed from the bag into which they had been exhausted, and analyzed. In each of eight experiments, three of which were made with a mixture of 1 volume of coal gas to 7 volumes of air, and five with a 1 in 10 mixture, a certain proportion of unburnt fuel was found in the exhaust. The quantity of carbon ranged from 2 to 4·3 per cent. by volume, and the quantity of hydrogen 0·8 to 3·7 per cent. by volume. These experiments seem to prove that from some cause combustion, even in the explosion of a strong mixture, continues some little time after attaining maximum pressure.

In the petrol-motor as ordinarily used, the air is insufficient to burn the petrol completely. Under these conditions, the efficiency of the engine, reckoned on the actual consumption of petrol, is, of course, much reduced, since the exhaust contains carbon monoxide and other substances of considerable heating value. Hopkinson and Morse, however, pointed out two years ago that if the efficiency were calculated on the heating value of the chemical changes which actually took place in the engine, it remained nearly constant over a wide range of mixture strength as was to be expected from theory. The effect of mixture strength on the efficiency of a petrol-motor has been exhaustively investigated by Watson during the past year. Some of his results are given in the following table:—

Air / Petrol by Weight.	Indicated Thermal Efficiency Calculated on		
	Whole Calorific Value of Fuel.	Calorific Value Corresponding to the Chemical Changes which Actually Take Place.	Percentage of Heat of Fuel Liberated.
14	0·248	0·251	99
13	0·235	0·264	89
12	0·220	0·278	79
11	0·204	0·287	71
10	0·185	0·289	64

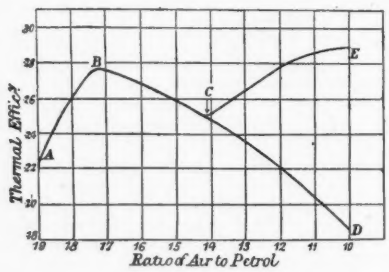


Fig. 3.

The curves, fig. 3, show the change of thermal efficiency with ratio of air and petrol by weight, beginning with a mixture having so little petrol as 1 part by weight to 19 parts by weight of air up to 1 part petrol to 10 parts air. The efficiency rises from A to B and falls from B to D. The line C to E starting from the point C on B D gives the efficiencies calculated on the basis of the heat liberated during the chemical changes which actually occur. The efficiency rises from point A to point B; the lower efficiency at point A being due to slow inflammation of the mixture for the speed of the engine, so that burning is continued after the constant volume phase is passed. B is the point of maximum efficiency; but it does not appear to be the point of maximum chemical combination. The most complete chemical combination is found at the point C. The fall of efficiency is doubtless due to the continually increasing flame temperature between B and C—that is, between a mixture of 1 part by weight of petrol to 17·3 parts of air and 1 of petrol to 14 of air. The increasing flame temperature with the richer mixture increases the heat loss and also the mean specific heat of the gases over the range of the temperature used, and so efficiency is diminished from both causes. From C to D the petrol is in excess; and hence the flame temperature must, on the whole, be falling. At the point D a very large quantity, however, of the fuel is being discharged incompletely burned, as only 64 per cent. of the heat of the fuel is liberated. Calculating, however, the line C E, which is the line giving the thermal efficiency of the engine for the chemical action actually completed, it is somewhat surprising and interesting to find how greatly the efficiency increases. With 1 of petrol to 10 of air, it rises as high as 0·289. For these tests the air standard efficiency was 0·46, so that the efficiency ratio was 0·64—an extremely high efficiency for so small an engine.*

This increase in efficiency is to be ascribed mainly to the reduction of flame temperature—much as in Dugald Clerk's supercompression experiments. A small increase is also to be expected

* Proc. Inst. Automobile Engineers, May, 1909.

† Hopkinson, "Engineering," Aug. 9, 1907; Clerk, Proc. Inst. Automobile Engineers, December, 1907; Hopkinson, *Ibid*, February, 1909.

‡ Professor Bone writes: "I am not in the least surprised that Dr. Watson has obtained evidence of some disappearance of carbon (as a soluble product) in his experiments; indeed, I should have been rather surprised if he had not obtained such evidence. Some years ago, working on the combustion of dense hydrocarbons in a Diesel engine, I found a considerable 'disappearance' of both carbon and hydrogen, which was at once explained when the water condensed from the exhaust gases was found to give a very strong aldehydic reaction."

* The portion C E of the curve is calculated by deducting from the calorific value of the petrol the heat which would be liberated if the CO, H, and CH_4 in the exhaust were burnt to CO_2 and H_2O. There is some uncertainty in the result, because there is undoubtedly some combustible matter in the exhaust which is not accounted for in the analyses. Moreover, in Dr. Watson's experiments the H and CH_4 were not directly measured, but were calculated by means of an empirical formula from the measured quantity of CO. Hopkinson and Morse worked out the heat developed by burning the oxygen present to CO, CO_2, and H_2O in the proportions found in the exhaust. The result obtained is rather different from that calculated by Watson's method; and this may account for the fact that Hopkinson found a smaller increase in efficiency with richness of charge than did Watson, though the observations on which his calculations were based were in good agreement with Watson's.

from the increase of specific volume which occurs on explosion, and which may amount to as much as 10 per cent. volume in extreme cases. Though this volume change is insignificant compared with that occurring in explosions of solids like gunpowder and cordite, yet it should strictly be included in calculations of thermal efficiency. It tends to make the efficiency of a petrol-engine rather greater than that of a gas-engine, in which the compression and heat supply per cubic foot are the same.

Radiation in Gaseous Explosions.

The importance of radiation in its bearing upon the calculation of volumetric heats from explosion pressures was pointed out in the first report. It is probable that the loss of heat from this cause, or at any rate that part of it which occurs during the progress of the flame, is independent of the size or surface area of the vessel, and cannot, therefore, be allowed for by a comparison of vessels of different sizes. Any considerable amount of radiation of this character will seriously affect the values of the volumetric heat obtained by explosion experiments.

Hopkinson has been investigating this question, and has made some progress during the year. He gives some of his results in Note No. 10. It will be remembered that at the meeting of the British Association in Dublin he described the results of some experiments which he had made dealing with the effect upon explosion pressures of the nature of the surface of the vessel. He coated the inside of the explosion vessel with tinfoil, and compared the results of exploding identical mixtures, first with the tinfoil brightly polished, and secondly when it was covered with lampblack. He found that the difference in maximum pressure was inappreciable, but that the rate of fall of pressure during cooling was considerably less with the bright than with the dark lining. This is in accordance with observations which have been made upon the effect of polishing the interior of the combustion space of a gas-engine, which has been found to result in a perceptible increase in mean pressure.

During the year, Hopkinson and his pupils have been carrying out further investigations on this subject. The results described in the last paragraph have been fully confirmed, and direct bolometric measurements have also been made of the radiation in an explosion. For this purpose a small portion of the surface of the explosion vessel was covered with thin copper strip, and the rise of resistance of this strip during the explosion was recorded by means of a quick-period reflecting galvanometer; a record of the pressure being taken at the same time. Comparative experiments were made, first with the strip polished as highly as possible, secondly with it blackened over, and thirdly after it had been protected from direct contact with the flame by means of a plate of rock-salt fixed in front of it. It was found that the rate of rise of temperature of the blackened strip during combustion and the early stages of cooling greatly exceeded that of the polished strip, and that the difference between them was roughly the same as the rate of rise of temperature of the strip protected by rock-salt. It appeared that the amount of heat lost to the walls of the vessel by radiation up to the moment of maximum pressure was, with a 15 per cent. mixture by volume of coal gas and air giving a maximum temperature of 2150° C., of the order of 5 per cent. of the whole heat of combustion; and there was evidence that the radiation continued for some considerable time after maximum pressure, until the temperature of the gas had fallen to 1400° C. The experiments are not yet sufficiently advanced to give a quantitative basis for the correction of volumetric heats obtained by explosion experiments; but Hopkinson considers they establish the fact of a material amount of radiation at the moment of maximum pressure and during the first stages of cooling.

Apart from their bearing on the determination of volumetric heats, these results, if fully confirmed and proved to be due to radiation, and not to differences in roughness of surfaces or other secondary causes, will raise interesting questions as to the origin of the radiation and as to the state of the gas at the moment of maximum pressure. Comparing the two explosions, one with the bright and the other with the blackened lining, it seems to be established that the maximum pressure and maximum temperature are the same. On the other hand, the experiment with the bolometer would seem to show that more heat has been lost in the one case than in the other; and therefore the energy of the gas enclosed with the bright lining is greater than that of the gas enclosed in the blackened lining, though the temperatures are the same. If this be the fact, there must be some want of equilibrium at this moment. Many chemists, including Bunsen and Professors Smithells and Dixon, have upheld the opinion that radiation from a gas, at any rate at temperatures such as can be obtained in an explosion, can only go on as a result of some sort of chemical or *quasi*-chemical action. According to this view, the want of equilibrium at the moment of maximum pressure must be due to incomplete combustion, and the continuing radiation after maximum pressure must be regarded as evidence of continued chemical action. This view as to the radiation from a gas is, however, not generally accepted; and the existence of radiation, therefore, cannot be regarded as conclusive evidence of continued combustion. If it be assumed that combustion is complete at the moment of maximum pressure, or very shortly after it, then the want of equilibrium at this moment disclosed by the experiments must be ascribed to purely thermal causes. The most obvious explanation in such a case would be that the translational and vibrational energies of the molecules have not attained their equilibrium proportion. Since the temperatures in the two explosions with bright and blackened linings are the same, the translational energies, which alone determine temperatures, must also be the same. It is conceivable, however, that the energy represented by rotation or vibration of the molecules may be greater in one case than in the other.

Measurement of Temperature.

In the first report, the importance of dissociation in connection with the gas scale of temperatures, which is the only scale at present available for explosion and gas-engine experiments, was pointed out, and a hope was expressed that an investigation of dissociation from this point of view might be undertaken by the National Physical Laboratory. The Committee are glad to be able to report that Dr. Glazebrook has given his sanction to such an investigation, which is now being carried on under the immediate superintendence of Dr. Harker; and that Dr. Glazebrook has shown his personal interest in this and the other matters engaging the attention of the Committee by joining them as a member.

The main object of the high-temperature research work which is now in progress at the National Physical Laboratory is to obtain direct gas thermometer measurements up to 1700° C. or 1800° C.; and it is to this object that Dr. Harker's efforts are being directed. On this inquiry, the question as to the amount of dissociation present in the measuring gas has an important bearing, and may properly be included in high-temperature research.

In order, therefore, to have the facts in a form for discussion, Dr. Harker prepared a note on the early work on dissociation, particularly the experiments of Grove and of Deville. [This note is printed in full in an appendix.] In view of the discrepancy which is apparent from the account given in this appendix between the statements of Deville on the one hand and the recent work of Nernst and Wartenberg (which has been confirmed by Holt) on the other, as to the actual amount of dissociation in steam, carbon monoxide and carbon dioxide, particularly at low temperatures, it seemed of interest to ascertain if light might not be thrown on the question by a simple repetition of one or two of Deville's fundamental experiments. Apparatus for this purpose has, therefore, been set up at the National Physical Laboratory, and was shown to the Committee on the occasion of their recent meeting at the Laboratory by invitation of Dr. Glazebrook. The methods and apparatus for the purification and the heat treatment of the materials used in the preparation of very refractory vessels were also explained.

Sir William Preece was especially impressed with the necessity of repeating this early work; and, accordingly, the Committee welcome the installation of Deville's experiments under modern conditions and with modern appliances for the accurate measurement of temperature which were unavailable in Deville's time.*

Measurement of Pressure.

It was pointed out in the first report that the determination of the energy function depended upon the measurement of the temperature of the gas experimented with, and that two methods had been used. According to one method, the gases themselves, which are within the engine cylinder or the explosion vessel, are utilized as the thermometric fluid; and according to the other method, the gas temperatures have been measured by a thermocouple or a platinum resistance thermometer. The first method of measurement by pressure changes necessitates the use of accurate indicators. In gaseous explosions, pressures and temperatures before ignition are comparatively easily determined, but pressures after ignition are often difficult of determination for purely mechanical reasons. The Committee are of opinion that for accurate work in gaseous explosions optical indicators offer marked advantages, and they recommend that in all investigations depending upon the use of such indicators the oscillation period of the indicator should be given. In the piston indicators used by Clerk and Hopkinson, this period is very easily determined. [The Committee give a photographic reproduction of an optical diagram taken by the Clerk indicator to determine the period of the instrument used for the experiments described in Note No. 11. In this indicator the oscillation period is 1-216th of a second. With a light spring diagram, shown in another figure, the period is 1-108th of a second—double the period of the other. To make certain that the indicator registered maximum pressure correctly, the piston was held up by a movable stop, so that the spring was compressed to within a few pounds of the maximum pressure. The first compression line is, therefore, omitted from a diagram produced in this way until nearing the maximum compression. The piston is then lifted from its stop whenever the pressure exceeds that put upon the spring by the stop, and the maximum pressure is indicated avoiding the momentum effect which causes the piston to tend to overrun its true pressure. This is clearly shown in another figure. A number of diagrams taken proved that the maximum pressure obtained with the stop in and with the stop out was the same.]

Oscillation-period experiments and experiments with a stop are recommended to determine the accuracy and sensitiveness of piston-operated indicators. Careful comparisons made by Professor Burstall and Professor Hopkinson of the Hopkinson optical

* Professors Smithells and Bone doubt the relevance of experiment according to Deville's methods to the question of flame temperature; though they welcome the proposed experiments from the purely scientific point of view.

and a specially-selected Crosby mechanical indicator proved that the mechanical indicator gave maximum pressures differing considerably from the optical indicator, except when the ignition was very slow, though the mean pressure was nearly the same. Experiments made by Clerk with another mechanical indicator compared with a Clerk optical instrument, showed deviations exceeding 5 per cent. in maximum pressures.

As showing the importance of temperature measurement in gaseous explosions, the Committee would refer to diagrams obtained by Callendar and Dalby, described in Dalby's Note No. 12. These diagrams showed a maximum temperature of 2500° C. of the gas and air mixture in a gas-engine cylinder—a temperature about 300° C. higher than any temperature obtained by ignition from atmospheric pressure. Professor Dalby is continuing his investigations, and many interesting points can be determined by his method of experimenting. The question of dissociation is directly affected by the possibility of getting temperatures of 2500° C. with any gas and air mixture whatever.

The Committee consider that their continued work will prove useful, and they therefore recommend that they be re-appointed, and ask for a further grant of £100. The Dublin grant has been carefully expended.

The report is followed by the two appendices referred to in it.

NEW STREET-LAMP DESIGNS.

This season, Messrs. Parkinson and W. & B. Cowan, Limited, have given special attention to lamps for inverted street lighting; and they are listing an inverted "arc" lamp, as illustrated, which is constructed of green enamelled steel, or all copper. It is made in three sizes—two, three, and four light. The notable features of this lamp are: All air-inlets of the burners are protected from the escaping products of combustion. Each burner is fitted with a gas and air adjuster, which can be operated from the outside. The burners are made of best brass, with magnesia

Parkinson's Gale-Proof Lantern and Inverted "Arc" Street-Lamps.

nozzle, and fitted with dual fittings (a patent for which has been applied for), with two sets of projections to carry any description of inverted mantle. They are wind, rain, and dust proof; British made; and inexpensive, but reliable. In their list, the firm give illustrations showing different methods of fixing the lamp on existing columns; and the effect is graceful and pleasing.

Messrs. Parkinson and Cowan have also added to their list a new pattern lantern of neat design—namely, the "Parkinson No. 870 Gale-Proof," which they claim to be wind and rain proof. This new lantern has been carefully thought-out to meet present-day requirements, and tested on their testing tower—being exposed to all kinds of weather. They have also greatly strengthened all the "Parkinson" series of lanterns, and lengthened the bodies, giving to the lamp a more graceful appearance. The No. 801 "Storm-Proof" lanterns still remain one of their most popular patterns; large quantities of them having been sold to sea-coast towns, where they are exposed to stormy weather. Every class of brasswork for street lighting is also manufactured by them, among which is the No. 9 anti-vibrator, which can be had fitted with almost any type of upright incandescent burner, and provides for both lateral and vertical vibration.

REGISTER OF PATENTS.

Geysers.

BARRALET, T. E., of East Finchley, N.

No. 17,697; Aug. 22, 1908.

This invention has for its object to provide means for increasing the heat efficiency of geysers, and also simple means for collecting the fluid of condensation from the hot gases from the burners.

The geyser is made with chambers or jackets through which the water passes, and the exterior surfaces of which are exposed to contact with the heated gases, or with surfaces in contact with the gases and over which the water to be heated passes. To increase the heating value of these surfaces, there is applied thereto a special arrangement of heat conductors—that is to say, heat-conducting media in the form of spirals or coils of wire or metal strip fitted in grooves formed, or provided, in the heating surfaces in such a manner that each convolution of the spiral is in contact with the surface at preferably one point only; the remainder of each convolution being exposed to contact with the hot products of combustion from the burner. Thus, in practice, the spirals or coils may be arranged with their axes at right angles to the path of the hot products of combustion, in which case the gaseous products would pass through the spaces between the convolutions or turns of the spirals; their heat being thereby more rapidly absorbed by the convolutions owing to their division into small streams or currents. Or the spirals or coils may be arranged with their axes in the direction of the flow of the heated gases, in which case the latter would be split up or divided into streams by passing inside and outside the spirals.

The heat absorbed by the spirals from the hot gases is at once conveyed by conduction to the heating surface to which the spirals are fitted, and, owing to this rapid conduction, and also to the fact that each convolution of the spiral absorbs only a small quantity of the total heat yielded up by the hot gases, the coils are not liable to burn.

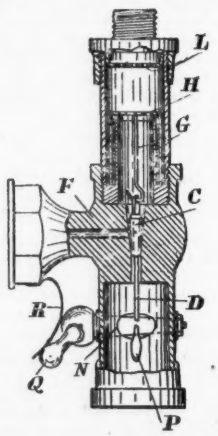
In order to prevent the fluid of condensation which collects upon the interior water-jacket from dropping on to the burner or burners, the upper edges of a perforated plate are attached to the bottom of the water-jacket, while the lower edges are in contact with, and preferably fixed to, the jacket forming the outside body of the geyser. Thus any condensation on the inner water-jacket runs down the inclined plates to the outside jacket, down which it flows and from which it can be easily collected and discharged at the base of the apparatus.

Safety Device for Automatic Gas-Meters.

WINTER, T., of Kensal Green, N.W.

No. 18,097; Aug. 28, 1908.

This invention relates to a safety device for meters of the class in which means are provided which, when the gas supply runs out, automatically close the pipe leading from the meter, so that, notwithstanding the supply being renewed, the gas is prevented passing until the valve is voluntarily opened. It consists in arranging in the exit pipe a



Winter's Automatic Meter Cut-Off.

valve comprising a tapered conical seating and a conical plug fitting therein; the plug being mounted with a certain amount of play upon a vertical pin carrying at its upper extremity a cylindrical cap, closed at the top and open at the bottom—the cap working in a gas-tight cylindrical casing.

On the exit pipe leading from the meter is a conical valve seating, with a conical plug C provided at its lower end with an extension or pin D passing through an orifice in the body of the carrier F. At its

upper extremity the plug is attached to a vertical pin G connected to a cylindrical cap H (closed at the top and open at the bottom) encased in a gas-tight cylinder screwed into a socket-piece or neck of the body F. The casing is made with a perforated top L, to allow the gas to percolate through as it emerges through the valve C and rises around the cylinder H on its passage to the fittings.

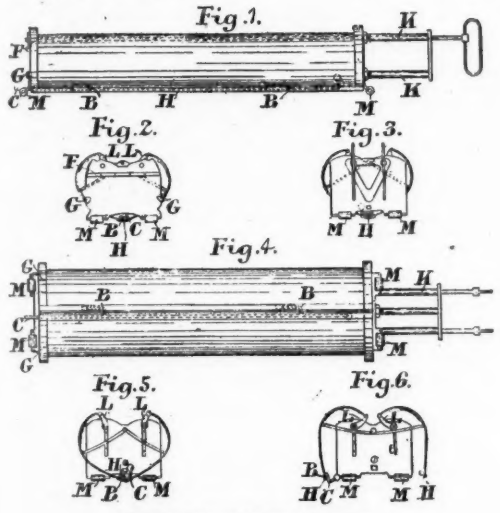
In operation, the pressure of gas, acting upon the cap H, maintains the plug C in its raised position, permitting the gas to pass; but as soon as the pressure is reduced or ceases, by reason of the supply of gas being consumed, the plug drops on to its seating and prevents any further passage of gas (when resupplied), as the pressure of the latter will not be sufficient, or acting in the proper direction, to lift the plug without an initial start. To give it this initial start, when required, a transverse arm N is fitted across an extension of the body F below the gas supply. The arm is provided with a small disc or lever P, which, when the arm is turned by (say) the handle Q, comes into contact with the end of the extension or pin D of the valve and lifts it, thereby giving it the initial start and maintaining the valve in the raised position so long as there is any pressure of gas acting against it. A spring R may be arranged to retain the valve-releasing arm N in the inoperative position.

Scoop for Charging Gas-Retorts.

BIRD, H., of Hornsey, N.

No. 18,334; Sept. 1, 1908.

This invention relates to the charging of gas-retorts with coal; and in accordance with it, the patentee provides a scoop which, filled with coal, is inserted in the retort and there automatically discharged of its contents, so that the retort (whatever its capacity) is fed with sufficient coal at one operation.



Bird's Retort-Charging Scoop.

Fig. 1 illustrates the scoop in side elevational view. Fig. 2 is a view of the front end; and fig. 3 is a similar view of the rear end of the scoop. Fig. 4 is a plan; and figs. 5 and 6 are cross sections showing the scoop in the closed and open positions.

The scoop is formed with an open top, and is divided into two halves longitudinally along the centre line of the bottom; the two sides being hinged to the extremities of the levers L at the top and held together by bolts B at the bottom, which are operated from a bar C extending the full length of the scoop and projecting a slight distance beyond the front end. Both ends are closed; the front end being hinged at F and kept closed by a spring or catch G.

When the scoop is pushed into the retort, the protruding end of the bar C, upon coming into contact with the end wall, slides back and releases the bolts B, and the weight of the coal contained in the scoop then forces apart the meeting edges H of the two sides of the scoop and forms an opening through which the coal falls.

Handles connected to rods, taking bearings in the two end walls of the scoop and in an extended framework or bracket K formed at the rear end of the scoop, are provided, and which handles, connected by the levers L to the sides of the scoop, permit of it being opened or of the sides being shaken by hand when required, after the bolts have been released.

Wheels M, on the ends of the scoop, travel upon a track provided within the retort, so as to facilitate the insertion and withdrawal of the scoops.

Incandescent Gas-Lamps.

CODY, R. D., of London, Ontario, Canada.

No. 25,428; Nov. 25, 1908.

This invention relates to gas-lamps in which are employed several inverted incandescent burners depending from a chamber supplied by a mixing-tube with the mixed gases for consumption—in some cases the burners, chamber, and mixing-tube being adjustable in relation to the gas supply pipe. The object of the invention is to simplify the construction of such lamps, to provide means whereby a more perfect mixing of the gas and air is effected, and the passage of gas from the supply pipe to the mixing-tube controlled, and to provide ready means for assembling and disassembling the parts of the lamps so as to facilitate packing. In connection with the chamber from which the gas issues to enter the mixing-tube, there is provided a regulating device, and the chamber is arranged on a construction of fitting comprising a link with a hollow portion adapted to conduct the gas from the supply pipe to which the link is secured to the chamber—the chamber being preferably provided with perforations through which gas issues in independent streams or jets to the mixing-tube.

Discharging Machines for Gas-Retorts.

WILLIAMS, P. E., of Leytonstone, Essex, and M'PHEE, N., of Poplar, E.

No. 18,335; Sept. 1, 1908.

This invention, relating to discharging machines for gas-retorts, &c. —the object being "to improve and simplify the construction, wherein constant pressure rams, internal packings, or pistons, and differential areas under pressure for the object of withdrawing the pusher after making the working stroke are dispensed with"—was fully described and illustrated in last week's "JOURNAL," p. 754.

Purification and Recovery of Tar, &c., from Blast-Furnace Gases.

NEILSON, W. C., of Coatbridge, N.B.

No. 28,462; Dec. 31, 1908.

This invention having reference to the purification of, and recovery of tar and other substances from, blast-furnace, producer, and like gases, is essentially a development of patent No. 28,508 of 1904. It has been found in practice in treating gases—especially producer gas where cheap bituminous coal has been used—that the tar is of a sticky or adhesive nature.

Instead therefore of using a washer or tar-extractor with a gauze diaphragm submerged in creosote oil as described in the earlier patent, according to the present improvements the elimination of the pitch, tar, or like substances retained by the gas, is facilitated by transforming the creosote oil or other suitable solvent of the tar into a gaseous vapour before admitting it into the tar-extractor or housing vessel in which the trapping appliances are fitted.

This may be accomplished by leading the oil by an automatic supply from the cistern shown in the 1904 patent into an ordinary construction of boiler with furnace, where the oil would be transformed into a gaseous vapour, which would be taken away by a pipe and admixed with the gas from the producer or blast-furnace before being admitted into the housing chamber where the tar-trapping appliances are fitted. Or a regulated supply of the oil could be fed from the cistern through a syphon or like pipe into a coiled pipe or evaporator located in the ordinary "silencer" attached to the gas-engine exhaust, and then mixed with the producer or other gas in the main leading to the housing chamber, where the tar-trapping appliances are fitted. Or the gas or vapour generated from the creosote or other oil might be led direct to the trap housing chamber before mixing with the producer gas.

The proportions of creosote oil vapour used depend on the temperature of the gas, and therefore of the viscosity of the tar. Thus in ordinary circumstances with the producer gas at a temperature of about 45° Fahr. about 1 part of oil in 7000 parts of gas by weight would be sufficient to reduce the viscosity of the tar. But if the temperature is lowered, the quantity of oil would require to be considerably increased.

Placing Coins in Slot-Meters Out of Reach.

ORCHARD, G. R., of Bath.

No. 1450; Jan. 21, 1909.

The "patentee" describes an instrument, long arm, or tongs for placing coins in slot gas-meters when out of reach or when placed high up from the ground, formed from a single length of wire bent upon itself to form a spring handle with parallel legs running side by side and at right angles to the handle. The shorter leg works in rings or loops on the longer leg; and the ends of the legs are bent at right angles to their length, and are fashioned into T-shaped jaws for the reception of a coin. An eye, ring, or loop in the shorter leg provides the means for operating the coin handle or wheel of the meter.

Grates of Gas-Producers.

BONE, W. A., of Leeds, and WHEELER, R. V., of Altofts, Yorks.

No. 10,230; May 11, 1909. Ante-dated Oct 29, 1908.

This invention relates to the construction of the conical grates of gas-producers—more particularly to the means for carrying the grate-bars from the lower end of the shell or casing.

The grate-bars are arranged in the usual conical manner—that is, suspended at their upper ends from the bottom of the casing and with their lower ends resting on a ring of a diameter suitably smaller than the diameter of the bottom of the shell. The upper ends of the bars are suspended by a cotter connection; the upper ends either fitting on supporting pins or studs (through which latter the cotters are passed), or passing through holes in an angle iron or other flanged ring. The pins or studs or the angle iron, as the case may be, are secured to the bottom of the cone or casing of the producer.

Colwyn Bay Gas Undertaking.—A special meeting of the Gas Committee of the Colwyn Bay Urban District Council has been held to receive the report of Messrs. T. Newbigging and Son, who were called in by the Council to carry out an investigation in regard to the administration and position of the gas undertaking. It was ordered because the return for last year was unsatisfactory, and an unusually large quantity of gas was unaccounted for. The report has not yet been published; but information as to its nature and conclusions has leaked out. It appears that the gist of the report amounts practically to a censure of the Gas Committee. It is stated that the concern is well equipped, is quite capable of turning out gas economically, and has a good class of paying consumers; and all that is necessary to make a success of it is good administration.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The St. Helens Vertical Retort Results.

SIR,—In the article in the last number of the "JOURNAL," on "Technology as Exemplified by the St. Helens Retorts," Mr. Holgate draws up, in Table II., a balance giving the weights of products obtained per ton of coal distilled, in tests made with the above retorts, and from his calculations concludes that the total weight of products recorded shows a surplus over a ton of from 4 to 10 per cent.

In making up this balance-sheet, Mr. Holgate has been obliged to assume the amount of water produced in the distillation of the coal—this figure not being available in the published information; and his assumption is that the quantity of such water produced was 100 lbs., or 10 gallons less than the yield of 10 oz. liquor per ton. Taking tests Nos. 2 and 3 in Table II., for which I am responsible, this means that he has taken the water yield as 29·6 gallons in the first case and 21·7 gallons in the latter. Such figures would, if true, certainly be very abnormal—especially the former—and in point of fact are much above the actual yield in both instances.

In making the test, the total quantity of virgin liquor, which represents, approximately, the water formed in the distillation, was determined separately; the observed figures being, in No. 2, 13·8 gallons, and in No. 3, 11·9 gallons. The specific gravity was 1·02. Taking these observed figures, in place of Mr. Holgate's estimated ones, the balance-sheet works out as follows (omitting fractions of a pound):—

	Test No. 2. Orrell Nuts.		Test No. 3. Thornley.
Density of gas computed from analysis (H = 1)	5·87	..	5·42
Weight of gas from 1 ton . . pounds	358	..	378
,, dry coke ,, . . ,,	1590	..	1590
,, tar ,, . . ,,	185	..	149
,, virgin liquor . . ,,	141	..	121
Total weight of products . . ,,	2274	..	2238
Apparent surplus or deficit . ,,	+ 34		− 2

In addition to these factors, other smaller ones ought to be taken into account, if it were possible to make an approximate estimate of them. To the weight of the products should be added that of the gaseous impurities removed in the scrubbers and purifiers, and of any small quantities of gas lost; while to the weight of the coal should be added that of the very small quantity of water evaporated into the gas from the coke-discharging apparatus, and of the nitrogen in the gas not derived from the coal, which items would tend to balance each other.

Taking into consideration the fact that, in a large-scale test of this kind, it is impossible to get figures accurate to a decimal place, I think the revised balance-sheet shows as good a general agreement as could be expected between the weight of the coal and that of the products obtained. The figures given for dry coke may be a little too high, as this depends on the accurate determination of the percentage of moisture in the coke as weighed. As everyone knows who has tried to sample a bulk of 50 tons or more of coke, this is far from being an easy matter; and on the whole the tendency of the error is to give rather too low a figure for the moisture, and in consequence somewhat too high a return for the dry coke.

With regard to Mr. Holgate's calculations of the gross and net calorific powers from the analytical data, it seems to me questionable whether it is advisable to base any very definite conclusions on the results of such calculations, in view of the fact that there are so many points of uncertainty with regard to them. One reason for this Mr. Holgate himself points out—namely, the doubt as to the exact nature and quantities of the constituents classed together as "unsaturated hydrocarbons," and, further, it must be remembered that the difference between the gross and net figures calculated from the analyses will often differ appreciably from that shown by the calorimeter in ordinary practice. For, in calculating the net figure from the analysis, the assumption is made that the whole of the aqueous vapour produced in the combustion is condensed to liquid water, whereas in actual working with the calorimeter this is by no means always the case. When the air passing through the calorimeter during the test only contains a low quantity of moisture, an appreciable amount of the water formed in the combustion passes away with the waste gases, which leave the calorimeter saturated with moisture, and usually at a slightly higher temperature than that of the atmosphere. The amount of such uncondensed water varies from time to time according to the moisture content of the atmosphere and to the proportion of air to gas passing through the calorimeter.

Mr. Holgate rightly points out that the yield of tar from Thornley coal should be 13·3 gallons per ton, and not 12·3 gallons as given in the "JOURNAL" for July 20, 1909. The figure 12·3 crept in through an error in transcription.

1, *Arundel Street, Strand, W.C., Sept.* 24, 1909. HAROLD G. COLMAN.

Manufactured Bitumen.

SIR,—I trust you will allow me to refer further to this matter, as dealt with in the "JOURNAL" for Sept. 14; but inasmuch as tar macadam roads have within the past year become of supreme importance, it incidentally brings one of my products to the front as a staple macadam binder.

I am thoroughly in accord with Mr. J. Walker Smith, the Chief Surveyor of the City of Edinburgh, who is a strong advocate for a standardized tar macadam cement. This gentleman, like the writer, has read "Lunge" with profit; and judging from his very able volume on the subject, has also, like the writer, studied tar distillation practically.

My idea of a durable tar macadam is a road surface of 4½ inches of rolled granite chips; then the melted cement (fluxed Vulco-Bitumen) poured over the grouting so as to fill all the interstices and leave a hot plastic surface to be spread over with very fine granite chips and again rolled. The heat to produce great diffusiveness of the binder is about 300° Fahr. Tar cement used in this way has a much stronger hold upon the mineral aggregate than where it is mixed under heat with the mineral aggregate and then placed *in situ* and rolled.

Of course, the formula can be varied and cheapened by shallower grouting and by sand sprinkled in the interstices between the granite-chips for roads carrying ordinary traffic.

It is quite within the bounds of probability that this scientific treatment of tar products will lead to the standardization of insulating compounds, and of tar macadam cement. If so, it will be a boon to both industries concerned, for the history of portland cement, and its ultimate standardization with its excellent results, warrants this sanguine expectation.

Kingston-on-Thames, Sept. 15, 1909. THOMAS MARRIOTT.

LEGAL INTELLIGENCE.

INJURY TO A GAS-MAIN BY A ROAD-ROLLER.

Damages against the Uttoxeter District Council.

At the Uttoxeter County Court, on the 17th inst., before his Honour Judge RUEGG, K.C., the Uttoxeter District Council were summoned by the Gas Company for £4 15s.—being £1 12s. 7d. for repairs to a gas-main alleged to have been broken by the defendants' steam-roller, and £3 2s. 6d. the estimated cost of the gas lost.

Mr. T. S. WILKINS, who appeared for the Company, stated that on the 30th of March last the tenants in the several cottages in Stone Road were considerably alarmed by an escape of gas. The Company were communicated with, and investigation showed that a large iron pipe, which had been put down so far back as 1879, had been broken in such a way as to cause a considerable escape of gas. No Act of Parliament was obtained originally to sanction the laying of the pipe; and no statutory power was granted to the Company until 1894. The Council had been content to make use of the main, and were, in fact, one of the largest customers of the Company.

Mr. FLINT, who represented the District Council, raised the point as to whether the main had been properly laid, having regard to the traffic.

Evidence having been given as to an escape of gas being detected by a female resident in Stone Road, who stated that on the day named above a steam-roller had been at work and passed her cottage in the morning, also that timber carts had often gone up the road,

Mr. *William Murray*, the Engineer and Manager to the Gas Company, said he remembered assisting at the laying of the main in Stone Road in 1879. It was a 2-inch cast-iron pipe, about ⅜-inch thick, and was new when put in. The new main was laid at a depth of 17 inches. This was quite sufficient, considering the state of the ground, which was solid gravel. Witness saw a piece of the broken pipe, which showed a clean fracture.

In answer to Mr. FLINT, witness said Mr. Marshall, the Surveyor to the District Council, had told him that a 10-ton steam-roller had been at work on the road. The quantity of gas lost was 25,000 cubic feet; and the escape was of a very dangerous character. He knew that 2 ft. 6 in. was the stipulated depth to lay a main in most towns; but that it all depended upon the nature of the ground. The length of life of a gas-pipe was 70 or 80 years.

Leonard Murray, son of the last witness, corroborated his father's statement; and *Edward Cheery* spoke to repairing the damaged main.

Mr. FLINT contended that the pipe was not at a reasonable depth, and that there had been other heavy traffic on the road in addition to the steam-roller.

Mr. *R. W. Marshall*, the District Surveyor, said that in March this year Stone Road was remetalled with granite, and a 10-ton steam-roller was used. The recognized depth to lay a gas-main was 2 ft. 6 in., and he had never found any pipes laid at a less depth than this.

Mr. *Rist*, the Assistant-Surveyor, said he did not consider the depth of the gas-main sufficient for ordinary traffic.

His HONOUR remarked that it depended on what was meant by ordinary traffic.

Witness said he meant such as steam-rollers and traction-engines.

Other evidence having been given as to the insufficiency of the depth of the main,

His HONOUR gave judgment for the plaintiffs, on the ground that the main was laid at a sufficient depth to meet the needs of the case at the time.

Mr. FLINT asked for leave to appeal if instructed.

This was granted, and costs were allowed.

Theft from the Chester Gas Company.

At the Chester Police Court, last Wednesday, a young man named William Youd was charged with stealing £5 10s. 4d. from the Chester Gas Company. Mr. T. B. Mason, who prosecuted, said the defendant was a collector in the service of the Company, and had made restitution of the money. Mr. F. A. Pye, the Secretary and General Manager of the Company, said he had gone through the books and found that the defendant had misappropriated the above-named amount. He had been in charge of the collecting from penny-in-the-slot meters, and had given receipts, but had not brought the money to the office. He had been in receipt of £90 a year, and had been in the employ of the Company for ten or eleven years. Mr. R. T. Morgan, for the defence, made a strong appeal for leniency, as the defendant to a large extent supported his widowed mother. He urged that the charge might be withdrawn, or that no conviction should be recorded. Accused was bound over for twelve months to come up for judgment if called upon—himself in £10, and two sureties of £5 each.

MISCELLANEOUS NEWS.

PROMOTERS' VICTIMS IN CONFERENCE.

Counsel's Opinion to be Taken.

Convened by Mr. C. S. Glover, himself a shareholder, the shareholders in the Ticehurst and District Water and Gas Company held a meeting last Tuesday, at the Westminster Palace Hotel, to consider their position in that capacity. The proceedings at the meeting further disclosed the methods of Mr. Eaton and his associates in their treatment of those who sink money in their promotions; and they also showed that Eaton and Co. are not held in very high esteem by those who have been induced, by plausible prospectuses, to part with their money. Mr. GLOVER (whose only interest in the matter is that of an injured investor) presided.

The CHAIRMAN said he had called the meeting so that those who were interested in the Ticehurst and District Water and Gas Company, either as share or debenture holders who were not disposed to lose their money, might decide upon a course of procedure for their mutual benefit. The circular-letter the shareholders had received informed them of facts with which they were probably not familiar; and he thought they were sufficient to enlist the support of all those who had found money for this concern in making an attempt to either obtain restitution or the control of the property, which should no longer be left to those who were not elected by the shareholders—those whose interests were inimcal to those of the shareholders. There was quite enough evidence of the omissions of the Directors, their unbusinesslike conduct, and their evident desire to shield the promoters, to satisfy everyone that the shareholders' interests had been sacrificed, and made subservient to those of the promoters and contractors, who had had over £34,356 of public money, and almost the entire capital of the Company. Some £67,000 had been expended; and the Directors would not, and indeed refused to, give an account of what had become of it. In his opinion, it amounted to a public scandal that the promoters and their nominees—self-elected Directors of this concern—should be allowed to defy the shareholders, and refuse for over four years to submit accounts to those who were entitled to intervene. But knowing the delay by petitioning the Board of Trade, it seemed preferable that shareholders and debenture holders should collectively combine. To this end, he had asked the shareholders to meet that day; and with the information disclosed in the circular, he thought they would agree that some immediate action was desirable. They must, however, act cautiously, and have expert advice as to the best course to pursue for their mutual interests. He had his own views, but desired to have the co-operation and assent of his fellow-shareholders, so that all might benefit by the action to be taken, and so there should be no individual preference or advantage. He had taken up the matter, and, having plenty of leisure, intended to see it through to a successful issue, which, of course, would be more complete if supported by the independent shareholders who had a care for the money with which they had parted. If anyone had troubled to visit the gas and water works, they would have been impressed with the absurdity of the whole scheme, and still more with the raising of no less than £67,000 in shares and debentures, the greater portion of which money had been paid to enrich contractors of no financial standing. The meeting and the letters of those who had written to him expressing their thanks for the championing of the cause were evidence of the majority being in favour of the course he suggested. Those present would be asked to approve of resolutions expressing their intentions and their wishes being carried into effect. He did not want to occupy time in detailing other facts that had come to his knowledge; what he had written he believed was sufficient to warrant the removal of the present Directors—viz., William Bentham Martin, Dr. William R. White, and A. W. Lunt—who were not appointed by the shareholders, whose interest appeared to be represented by a very few shares, and who, he believed, had received considerable sums for fees, and, if he was rightly informed, had participated in the promoters' profits. He could not conceive, under the circumstances, any persons of gentlemanly feeling desiring to retain control of the Company's affairs; and, if these Directors would not resign, they must be removed. They should be no longer allowed to retain a position which was not to the interest of the shareholders. Indeed, he was advised that the issue of the prospectuses inviting capital was legally misleading, and that the Directors were responsible to the shareholders for any loss they might suffer. No dividend had been paid to the shareholders. He had not received any since he parted with £350 in 1903. It might be said, "but the interest on the debentures has been paid." This was not evidence of a solvent business, nor that the revenue had justified the payment. There was no profit from running this curious concern. The interest on the debentures was simply a return of the shareholders' money. For this purpose further issues were from time to time made; and those who had had the interest apparently did not trouble as to whence it came.

Mr. W. ALBERTE said there had been no meeting of the shareholders called since 1904, nor during the same period had any accounts been submitted. In the last accounts exception was taken by the Auditors to a large number of items for which they were unable to vouch, seeing that vouchers for considerable sums of money were not produced, and the revenue account was in a chaotic state. There had been communications with Messrs. Keen and Co. and Messrs. Saker and Davis, who had been asked to have the audit completed; but they had been unable to comply. The Auditors had been defied by the Directors; and no information could be obtained as to the £60,000 odd the shareholders and debenture holders had in all provided. In response to his circular, Mr. Glover had received a large amount of correspondence, representing something like four-fifths of the whole of the capital of the Company, which showed that he had the support of a large majority of the shareholders. Some of the letters were heartrending. Certain of the shareholders—such as postmen and labourers—had put the whole of their savings in the Company; and there was nothing between them and the workhouse. Some steps should be taken to bring retribution to these particular promoters. One gentleman—who was 75 years of age—suggested that steps should be taken to bring the matter before the Public Prosecutor. Another gentleman who was a small shareholder, holding £50 of shares, also said he should like to see the Public Prosecutor take up the matter, and those responsible punished. During the past five years, shareholders had received no less than seven letters from the Secretary, stating that the accounts were being audited, and that it was hoped soon to clear up the matter. As late as Aug. 25, a letter was received, saying the accounts had been thoroughly looked into by the Auditors, and that it had been thought best to bring them up to the end of last year. It seemed pretty clear there was no intention to render an account at all.

Mr. A. J. RUTTER remarked that he had persuaded his daughter to invest £30 in the Company, and he himself had invested £50. He took over his daughter's holding, but had had the greatest difficulty in regard to the transfer. He had found Eaton was not a member of the Institution of Civil Engineers, though he called himself "C.E."

Mr. HOOPER said he had been a shareholder in the Amman Valley and Laindon Companies, which were promoted under the same auspices; and so he had had unpleasant experiences before this with Eaton and his colleagues. He thought it was very desirable that there should be an investigation to ascertain whether anything could be recovered, and to see what steps should be taken to put the Public Prosecutor on the track of Eaton. He related some of the experiences he had had with the Amman Valley Company and with Eaton.

Mrs. GOODSON stated that she was interested in five other of these Companies as a share or debenture holder. She had received a letter to the effect that the Directors of one of the companies had no cash with which to pay the debenture interest for the past half year; and they therefore proposed to defer payment until Sept. 29 next.

Mr. HOW said he visited the Ticehurst district some two years since; and, in his opinion, there was not much in the shape of assets. He found there was something like water-works there; but he did not see any gas-works.

Mr. M. SEECK considered the information the shareholders had was quite sufficient to show that the assets were practically *nil*. He thought it would be best to "go" at once for the promoters and those responsible for the expenditure of the money.

Mr. M. J. JARVIS (Solicitor) inquired whether it would not be better to pass a resolution for the removal of the Directors first, and so get in the shareholders' own nominees.

In the course of further discussion, it was mentioned that letters had been received from debenture holders who stated that they had not received their interest. One lady at the meeting said she had received hers, but only by the application of pressure. It was thought by Mr. Hooper that a Committee of Shareholders should have a valuation made by a responsible engineer or surveyor; and then seek Counsel's opinion as to the best method of making Mr. Eaton disgorge some of the money belonging to the shareholders. From another quarter came the advice that as Mr. Eaton was in such "hot water" with other people, whatever was done should be done quickly. What they had to do was to save the assets.

In much the same strain, the discussion continued; and it ended by the following resolution, proposed by Mr. R. DEAN, and seconded by Mr. SEECK, being unanimously adopted: "That Mr. Glover be requested to take the opinion of Counsel as to the course to be adopted for the recovery of the shareholders' money, and to employ the necessary expert evidence and assistance to obtain it, and to report to the shareholders."

A vote of thanks was passed to Mr. Glover for the initiative he had taken in this matter, and for his conduct of the proceedings.

THE PROPOSED NEW GAS-WORKS FOR BELFAST.

The Question of a Site.

At a recent Meeting of the Gas Committee of the Belfast Corporation, the City Surveyor (Mr. H. A. Cutler) and the Gas Engineer and Manager (Mr. Robert Sharpe) submitted a statement furnishing the following particulars in regard to the various proposed sites for the new gas-works: Ormeau Park (area 27 acres)—Works site capacity in cubic feet per day gas output, 10 millions; capitalized cost of site, £24,345; cost per million cubic feet capacity, £18,003. Ormeau Park and Glentoran (area 25 a. 2 r. 12 p.)—Works site capacity, 10 millions; capitalized cost of site, £23,720; cost per million cubic feet capacity, £18,560. Donegall Road (area 52 acres)—Works site capacity, 20 millions; capitalized cost of site, £25,535; cost per million cubic feet capacity, £19,999. Cranmore (area 30 acres)—Works site capacity, 10 millions; capitalized cost of site, £4200; cost per million cubic feet capacity, £22,078. Twin Island (area 56 acres)—Works site capacity, 20 millions; capitalized cost of site, £42,000; cost per million cubic feet capacity, £14,692. Brick-Works (area 26½ acres)—Works site capacity, 10 millions; capitalized cost of site, £9938; cost per million cubic feet capacity, £18,053. In a note attached to the statement, it was mentioned that the cost of the works to the ground level and the loss on the carriage of coal had been estimated for works of 10 million cubic feet daily capacity for all the sites; but the areas of land estimated for the Donegall Road and Twin Island sites were sufficient for works of 20 millions daily capacity; so that in both these cases it was necessary to deduct half the capitalized cost of land in arriving at the cost per million cubic feet capacity.

The statement having been fully considered by the Committee, Mr. Squire moved, and Mr. Workman seconded—"That it be reported to the Council that, having made very full inquiries as to the merits of the sites offered for the auxiliary gas-works, the Committee are of the opinion that the site known as the East Twin site, containing an area of 56 acres, would be the most advantageous for the purpose; and they recommend the Council to authorize the Committee to enter into provisional arrangement with the Harbour Commissioners, and to proceed to obtain all the necessary parliamentary and other powers." To this an amendment was moved—"That all the sites be sent forward, and that we recommend the Council to select from the sites known as the Twin Island, the Ormeau

Park, and Donegall Road, the most suitable." The Committee having divided on the amendment, it was declared lost. A further amendment was moved—"That all the sites selected be voted upon in the order of merit, and reported to the Council in that order;" and this was agreed to. Accordingly, a vote was taken, with the result that it was resolved —"That it be reported to the Council that the following three sites are, in the opinion of the Committee, the most advantageous: East Twin Island, Ormeau Park, and Brick-Works; that the Committee are equally divided as to whether the Twin Island or the Ormeau Park is the most advantageous of all the sites offered; and the majority of the Committee are of opinion that the Brick-Works site is the third most suitable of those offered." It was then resolved to request the Lord Mayor to convene a meeting of the Corporation to select a site.

A special meeting of the Council of the County Borough of Belfast was held last Thursday, to receive the minutes of the Gas Committee relative to the selection of a site for the proposed auxiliary gas-works, and to authorize the taking of the necessary steps to acquire it. The subject was introduced at some length by Mr. Doran, the Chairman of the Committee; but, after some discussion, its further consideration was adjourned till to-day.

ROCHDALE CORPORATION GAS UNDERTAKING.

Lower Coal and Oil Contracts—Proposed Reduction of Candle Power.

The Gas Committee of the Rochdale Corporation last Wednesday accepted tenders for the supply of coal for the gas-works during the ensuing year. There were 37 tenders, and they had been carefully considered by the Works Sub-Committee, who submitted their report and recommendations. The Committee gave orders to twelve or thirteen firms; the total quantity to be supplied being about 55,000 tons. The prices average about 9d. per ton less than last year, which means a saving of £2000 to the Gas Department. The coal will be obtained from fifteen different pits. A larger quantity is being procured from Yorkshire than has been done for a considerable time; and this, it is stated, accounts for a substantial portion of the reduced cost. More orders than usual have gone to local firms. The Committee also decided to enter into contracts for the supply of 800 tons of petroleum to be used in the manufacture of carburetted water gas. Here again the price showed a reduction; being the lowest the Committee have paid. The having on these contracts is about £400.

The Committee also passed a resolution directing the Town Clerk to apply for a Provisional Order from the Local Government Board to enable them to vary the illuminating power of the gas supplied in the borough, and alter the arrangements for testing it. This action was taken on the recommendation of the Engineer and Manager (Mr. T. Banbury Ball) and the Works Sub-Committee. For many years the illuminating power of the gas has been about 18 candles. The Corporation, under their Act of 1872, have power to lower it to 16 candles; and it is understood that it is not proposed to go below this at present. With a reduction to 16-candle power, the saving is estimated to be between £2000 and £3000.

TORQUAY GAS COMPANY.

Reduction in Price—Electricity v. Gas for Street Lighting.

The Half-Yearly Meeting of the Torquay Gas Company was held last Wednesday—Mr. W. B. Beynon, the Vice-Chairman, presiding.

The Secretary (Mr. R. P. Kitson) read the notice convening the meeting, and also the report and accounts for the six months ending the 30th of June. They showed that the income was £17,967 and the expenditure £14,303. Payment of the half-year's dividend would absorb £3411; and there would be left a surplus of £253. Coals cost £2250 less than in the corresponding half of 1908; and even with the oil and coke used for the new oil-gas plant, which was not working last year, the cost of raw material showed a reduction of £1150. There was a saving of nearly £200 in purification—a satisfactory result of the new system which had been adopted. In accordance with the wishes expressed by the Directors and shareholders, a bonus amounting to £372 had been paid to the employees, to commemorate the jubilee year of the Company. The sale of gas had realized £250 more than before; but there was some reduction in the revenue from residuals. It had been decided that from the 29th inst. the price of gas for ordinary consumption should be reduced from 3s. to 2s. 11d. per 1000 cubic feet.

The Chairman moved the adoption of the report and accounts, and the payment of interim dividends at the rates of 10 and 7 per cent. He congratulated the shareholders on the progressive character of the Company's business, and said the further reduction in price would no doubt tend to stimulate consumption.

Mr. Young, in seconding the motion, referred to a new departure which had been made in appointing an inspector to bring to the notice of people the great advantage of the use of gas at low price, and to advise as to lighting, cooking, and heating. He thought that this would have good results in retaining consumers.

Mr. Martin suggested that it might be advisable to also have a lady inspector to give hints and advice to cooks and others as to the best use of cooking-stoves. Attention might likewise be drawn to the fact that gas under pressure gives a better light than electricity, at something like half the cost.

Mr. Young, referring to the suggestion to have a lady inspector, said he thought the arrangement already made would answer all purposes; but if in the future a second appointment was made, it might be a lady. As to the supply of gas under pressure, the street lighting in Torquay was under the control of the Corporation, who owned the electric light works. Under these circumstances, it was most difficult for a Gas Company to induce the Corporation, no matter how cheap the supply of gas might be, or how brilliantly they could light the streets, to oust the electric light. Corporations who had this light under their control gave the preference—naturally, perhaps—to the product of their own undertaking, though the cost might be two or three times as much as that of gas. He believed that in Torquay at present the streets could be lighted better by gas than by electricity, and at half the outlay. In fact, a penny rate was being lost by the use of electricity for street lighting. The price charged by the Corporation should be £10 or £12 a year, instead of the £20 paid for the very indifferent arc lights.

The motion having been carried, thanks were accorded to the Chairman for presiding; and the proceedings closed.

NOTABLE ACHIEVEMENT AT NEWPORT (MON.).

Lighting of Rogerstone.

In July last year the lighting of Rogerstone, Tydu, and Cefn was determined upon by the Parish Council. A movement had been previously set on foot to introduce electric lighting; but when it was found that only 27 public lamps could be obtained at the cost of a 3d. rate, and that the introduction of electricity would be useless for the purpose of cooking and heating, the Council became convinced that there was no other scheme to equal the one which had been proposed for their acceptance by the Newport (Mon.) Gas Company. All the above-named districts are in the Company's statutory area of supply.

For various reasons of a legal character, the actual order to the Company for the lighting was not given until the 14th of April last. It involved altogether the laying of upwards of seven miles of mains and some 420 services, both for private consumers and public lamps. About 300 additional houses are also expected to be built very shortly in the district. The work was commenced on the 13th of May; and on the 1st inst. Rogerstone was lighted by gas. At that date also, the whole of the seven miles of mains had been completed, the entire number of the public lamps erected, and more than half the services laid. The 5-inch trunk main connecting the Mill-Street works of the Company with Rogerstone (a length of 2¾ miles) was laid in a month. For more than a quarter of this distance the excavation for the main was in rock, and the greater portion of the remainder in ordinary macadam.

The lighting is on the high-pressure incandescent system. The gas is compressed at the works, and sent to the end of the trunk main, where the high pressure is converted into any grade of low pressure that may be required, according to the circumstances of supply in the district. The compressors were made by the Bryan Donkin Company, Limited, the steel trunk main by the British Mannesmann Tube Company, Limited, the cast-iron mains by Messrs. Jordans, Limited, and the lamp-pillars by Messrs. T. Spittle, Limited. The burners in the public lamps give a splendid light. The governors for transforming the pressure, though made in England, are the Johnson-Reynolds, which are extensively used in the United States. They were first introduced into Europe by Mr. Thomas Canning, the Engineer and Manager of the Newport Gas Company. The work, which was executed by direct labour, was supervised throughout by Mr. H. D. Hazell, under the direction of Mr. Canning.

LEIGH-ON-SEA GAS UNDERTAKING.

Ratepayers Discuss the Position.

A Public Meeting, convened by the Leigh Ratepayers' Association, was held last Tuesday, under the presidency of Mr. F. J. Green, to consider the position of the Urban District Council gas undertaking.

Mr. F. S. Farris, in opening the discussion, traced the history of the gas-works from the time they were taken over by the Council. He said it was thought by many that they would be nothing but a "white elephant." Some people considered they did not and would not pay. But he knew that they did pay, and he was certain that they would continue to do so. He did not think, however, that they got as much from them as they should get, as the bye-products could have been worked much more profitably than they had been. Coke in particular could be sold in a different and better way than it was now. There was, too, a large amount of gas unaccounted for. Last year they made 17,376,000 cubic feet of gas, of which 15,350,000 cubic feet were accounted for; leaving 2,026,000 cubic feet unaccounted for. This quantity was far too great. The amount of gas they were making was 8oco cubic feet per ton of coal; whereas many other places made 11,000 cubic feet. As to the extension of the gas-works, the estimate had been exceeded; but he thought the extra expense was necessary, and would be more than repaid, inasmuch as the improvements carried out by means of the additional expenditure would allow of the work being done much better. The Gas Committee were amateurs in gas work. He certainly thought they should have the advice of an expert; and he was of opinion that there was a man now in the Council's service who was quite capable of filling the post. He moved—"(1) That this meeting expresses its confidence in the Gas Committee and thanks them for their services in connection with the reconstruction of the gas-works. (2) That this meeting recommends the Council to charge the cost of the proposed new gasholder against the reserve fund and the revenue account, and that in view of the fact that additional mains, stoves, meters, &c., must be continually provided to keep pace with the increasing consumption of gas, the Council should take steps to obtain greater borrowing powers without delay. (3) In order to create a greater demand for gas and economize its cost of production, this meeting recommends the Council to provide gas-fittings to houses, and fit them with slot-meters free of charge; to make it more widely known that coke can be obtained in retail quantities, and offer greater inducements for the inhabitants to purchase it; and to consider in what way the residual products can be rendered more valuable. To assist in carrying out these recommendations and to give advice to the Gas Committee, the permanent services of a man well up in theoretical and practical gas making in all its branches should be obtained; and they would suggest that Mr. Sargeant, the present Assistant Gas Manager, be offered the position."

This comprehensive motion having been discussed at some length, Mr. N. Arnold, the Chairman of the Gas Committee, said it must

be admitted that the gas undertaking had not been much help to the ratepayers up till 1904. Before that time the works had had to be supported by the rates; but they had since paid their way, and accumulated £3000, despite the fact that when they were bought they were a bad bargain. They now had new buildings, which cost nothing like the amount expended on the old ones.

Others speakers followed with observations in favour of the gas undertaking.

Mr. DURRANT, the ex-Chairman of the Gas Committee, dealt with the question at some length, and submitted a number of figures. He concluded by moving, as an amendment: "That this meeting expresses its confidence in the Council's gas undertaking."

Mr. W. T. TAYLOR seconded the amendment.

Mr. S. F. JOHNSON thought that much of the criticism levelled against the gas-works was premature; and he did not consider they had had a fair chance of showing their capabilities as relievers of the rates. He hoped it would always be remembered that the gas undertaking was labouring under difficulties that should never have been placed upon it. There was no need for alarm over the gas-works; and his advice was that the ratepayers should hold on, as they had a good thing.

Mr. MEACHEN said that in the past he had criticized the gas undertaking; but when he was on the Council he served on the Gas Committee, and could say that it was one of the best working Committees the Council had ever had. The concern would be a profitable one if they only had patience.

The motion having been withdrawn, the amendment was carried unanimously.

BOLTON GAS AND ELECTRICITY UNDERTAKINGS.

Elective Auditor on the Accounts.

In his annual report on an audit of the Bolton Corporation accounts for the past year, Mr. W. A. Bridson, one of the Elective Auditors, makes the following reference to the gas fund: "The gross profit on this fund is the lowest since 1901. A steady decline is noticeable during the last three or four years, due to the increase in the use of the electric lighting system or incandescent lighting. The amount set apart out of revenue for the renewal of works and plant account—£7341, as against £11,294 in the previous year—seems very small, when we consider that during the year a sum of £14,404 has been spent on the re-building of the retort-house at the Lum Street works and the renewal of mains and meters. The balance to the credit of the depreciation account at the end of the year is shown at £5767, compared with £12,647 at the end of the previous year. The sale of meters and fittings for the twelve months, after charging wages, cost of materials, &c., shows a profit of £1162; while a loss of £816 is shown on the cooking and heating apparatus department. After making due provision for sinking fund charges, a sum of £17,500 is handed over for the relief of the rates. The balance in hand on the capital account is £26,409."

Dealing with the electricity undertaking, Mr. Bridson records a slight decrease in sales on the year, and adds: "The depreciation for the year written off the various assets of this fund appear to be quite inadequate—namely, £18,747; but against this instalment on loans to the extent of £12,829 has been written off, and the balance of £5917 is the actual amount placed to the credit of the account for the year to meet renewal of plant, &c. After allowing for all charges, the amount handed over for the relief of the rates was £6800, compared with £7500 in the preceding year; and a sum of £2680 was carried forward to the current year's revenue account." Mr. Bridson says the capital account is over-spent to the extent of £25,543; while the total amount of debt extinguished on this fund since the commencement is £87,582. During the year, the expenditure on capital account was £19,820, making a total outlay of £345,122.

The total debt of the borough is now £4,034,892; but there are accumulations of sinking fund amounting to £367,816, leaving a net debt of £3,667,076. Mr. Bridson puts down the realizable assets as follows: Gas-works, electricity works, tramways, water-works, markets, and chief rents, &c., at cost, £3,373,457; so that if all liabilities on the works were extinguished, there would be a net surplus of £845,153.

ELECTRIC LIGHTING IN THE CITY OF LONDON.

Proposed Great Disturbance of Streets.

A certain amount of consternation was caused in the City last week by the intimation, reported to the Court of Common Council on Thursday, by the Streets Committee, of a notification received from the County of London Electric Supply Company, Limited, of their intention to commence the laying and amending of extra high-pressure electric mains and three 2½-inch iron conduits crossing London Bridge, thence along the east side of the bridge to Adelaide Place and King William Street to Monument Station, crossing Eastcheap and going along the north-east side of King William Street to Lombard Street, crossing Cornhill and Threadneedle Street to a position facing the Bank of England near the intersection of Princes Street, thence northwards along the east side of this street to Lothbury, crossing Lothbury and thence along the east side of Moorgate Street to London Wall, crossing London Wall and thence northwards along the east side of Finsbury Pavement to South Place, and crossing South Place to the boundary of Finsbury, as indicated on a plan accompanying the notice.

Mr. Millar Wilkinson asked if there were no means of stopping this great upheaval of the streets, many of which had been recently repaired, in the very heart of the City. Here was an Electric Supply Company at Deptford wishing to furnish electricity at Hampstead; and they were going to disturb the whole of the central and busy parts of the City of London. He would move that the City Solicitor be requested to communicate with the Company to see if it were not possible even now to prevent this nuisance. The necessary permission having been given, the Lord Mayor called upon Sir Homewood Crawford to respond. He stated that the Company were acting quite within their powers in making application for permission to lay their mains along the route in question, under the Act of 1908; but, the Corporation could, if they were not satisfied, withhold their consent, and suggest an alternative route. If this were not acceptable to the Company, application for arbitration could be made to the Board of Trade, whose decision would be final. Mr. Millar Wilkinson then asked Mr. Turner, the Chairman (*pro tem.*) of the Streets Committee, if, in view of the fact that the statutory notice of one month given by the Company would expire on the 15th prox., he had considered the question of an alternative route; and, if not, whether he would call a special meeting of the Committee to deal with it. Mr. Turner replied that he was fully alive to the matter, and would consider the advisability of at once convening a special meeting of the Committee for the purpose mentioned.

KEIGHLEY CORPORATION GAS SUPPLY.

Reduction in Price.

At the Meeting of the Keighley Town Council last Tuesday, the Gas Committee presented a report for the year ended the 30th of June, which showed that the gross profits of the gas undertaking for this period had been £14,609. After meeting interest, the instalment of the sinking fund, renewals, and insurance charges, there was left a net profit of £6191. Of this sum, the Committee proposed to transfer £5550 to the relief of the rates; and they recommended that £50 be given to the funds of the Keighley Victoria Hospital, and that the gas charges be reduced to 2s. per 1000 cubic feet to ordinary consumers within the borough, and 2s. 3d. outside; to 2s. 1d. in the case of the public lighting authorities; and to 2s. 5d. to prepayment meter consumers, with proportionate reductions to large power users. In moving the adoption of the report, the Chairman of the Committee (Mr. John Harrison) explained that the output of gas for the year showed an increase of nearly 5 million cubic feet. The Committee estimated that a considerable saving would take place during the present year on account of cheaper coal, and there should also be economy in the working owing to the improved machinery which had been put in. It was hoped that the year would yield an additional profit of considerably more than £1000; and the reductions proposed would represent a total sum of upwards of £1100 per year; so that the gas consumers would benefit to this extent. Alderman King thought that the report was an extremely good one, and expressed his pleasure at seeing that at last they were getting the price of gas down to 2s. per 1000 cubic feet. Alderman Howley urged a reduction in the price of gas to prepayment meter users by making the charge to them 2s. 3d. instead of 2s. 5d. per 1000 cubic feet. He moved this as an amendment. After discussion, however, it was lost by 15 votes to 5; and the Committee's recommendations were adopted.

HOUSE-WIRING AND ELECTRICITY SUPPLY.

Are Cheaper Systems Possible?

The above subject was dealt with by "An Engineering Correspondent" in an article in the Engineering Supplement to "The Times" last Wednesday. The writer first considers the causes which have operated to render the present commercial prospects of the electricity supply business more uncertain than, in the opinion of many, they have ever been, and then proceeds to suggest remedies. He considers that the electricity supply authorities made a great mistake in not obtaining control over the sale of the new metallic filament lamps which have been introduced during the past three years, instead of leaving it in the hands of the contractors. The demand for these lamps has, he says, been enormous, and the results to the undertaking disastrous. Another factor which militates against their prosperity is the low rate of increase of new connections, or, expressed in other terms, the high cost of house-wiring. During the present year, several new and cheaper systems have been evolved; and, in the writer's opinion, the only way to acquire new connections is by pushing these cheaper wiring systems, by which electric light is brought within the reach of many who could not previously afford to have it installed. But it is pointed out that, while many unwired houses belonging to the middle classes would represent paying loads, even with metallic filament lamps, there are many more owned or tenanted by smaller people whom, under existing conditions of service and tariff, it would hardly pay to supply, and yet who, under the Statute, can compel the undertakers to connect them if they are within 20 yards of the mains. Therefore, though it might not be desirable for the authorities to push cheap wiring under existing conditions of services and tariffs, they must reckon with the eventuality that the electrical contractors will do so, just as they have done with the metallic filament lamps.

While, however, increased connections appear to be the salvation of the electricity supply undertakings, the writer points out that considerable care will have to be taken by the authorities that they do not lead to decreased revenue. In order to avoid this, there appear, he says, to be two methods immediately available, and a third which, sooner or later, will have to be adopted generally where it is not already in force. The first method is a technical one—namely, reduction in the cost of service. It involves the service cables, meter, cut-out, and labour. The second—the adjustment of the tariff to meet the new conditions—is a financial one. The writer considers that, essentially, what is required of an ideal tariff is that there shall be a first fixed charge on the consumer to meet the standing costs of the undertaking, and a second small charge to meet the running charges of the undertaking. The fixed charge being secured, the undertaking stands to make no loss even if the consumer does not use any current. There are several ways of securing the fixed charge, such as the Norwich system, which involves a percentage of the assessed value of the house; and making a definite charge per lamp installed per annum. Quite recently, the

Marylebone Borough Council have introduced a so-called "telephone" system of charging; the standing charges being secured by a sum fixed after an inspection of the installation, and based upon the probable maximum demand. What is certain is that the flat-rate and the maximum demand system, together with all scientific systems that attempt to make the consumer alter his methods of living or penalize him if he does not do so, "have turned out economic failures."

A third method, without which the second cannot be a success, and no electricity supply undertaking will prosper, is more drastic. On this matter the writer says: "Boards of Directors and Electricity Committees must wake up, and must recognize that electricity supply is a commercial and not a technical question. There is no reason why the new and cheaper methods of wiring now on the market should not bring in the increased revenue for which the undertakings are all thirsting. But the authorities should not leave it to the manufacturers and the contractors only to push the business, because by so doing they may lose control over new wiring systems, as they did with the new lamps." By using the word "control," the writer does not suggest that the business should be taken out of the hands of the genuine contractor; but the efforts of the electricity supply authorities should be directed to seeing that no installations are carried out which, by reason of insufficient number of light points or other causes, could in any way make the consumer an unprofitable customer.

WATER SCHEME FOR MONMOUTHSHIRE.

Proposed Water Board for the Western Valleys.

The Monmouthshire County Council, as well as a number of the Local Authorities of the county, have from time to time promoted various water schemes; but up to the present their efforts have been more or less unsuccessful. The Local Authorities of Abertillery, Abercarn, and Risca have lately again had the question under consideration. Abertillery already possesses a reservoir capable of storing 40 million gallons; but this, it is feared, is seriously interfered with by various subsidences. Abercarn is more gravely situated, for the district, which is rapidly increasing in population, is mainly dependent on mountain springs, and the supply of water is gradually diminishing as mining development takes place. The Risca Council have recently acquired the waterworks of the Western Valleys Gas and Water Company. But the supply is not sufficient for the demand; and as the population of the Risca area is increasing at a greater rate than in either of the other districts, the position has become serious.

It was with these facts before them that representatives of the Local Authorities mentioned assembled to consider the general position. After a number of meetings, they decided to ask Mr. Baldwin Latham to advise them. He has now presented a report in which he recommends the formation of a Water Board for the Western Valleys. He has submitted a number of schemes having the source of supply in the Grwyne Valley in Breconshire. A modified scheme shows the cost of constructing one reservoir in the valley at £250,000. It will have a capacity of 315 million gallons, will supply 1½ million gallons per day, and provide compensation water at the rate of 750,000 gallons daily. The site is at an altitude of 1650 feet, which will give ample pressure to supply the highest points in the district connected with the scheme. It is proposed to take over the whole of the existing liabilities of the three authorities interested—viz., Abertillery, £59,801; Risca, £30,000; and Abercarn, £8108—total, £98,000. It is also proposed to obtain parliamentary powers for supplying water to other authorities.

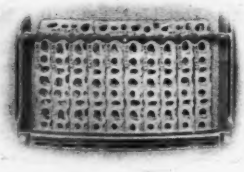
NEW CATALOGUES, &c.

The Richmond Gas Stove and Meter Company have, so far as we are aware, hit upon quite a novel idea in the issue of their "Richmond's gas-steam radiator post-card album." This contains four-dozen picture post-cards, in eight different designs. The illustrations depict the adaptation of the gas-steam radiator to the heating of ball-rooms and theatres, factories and workshops, school buildings and class-rooms, places of worship, the modern home, shops, and public buildings. Thus a wide range of choice is offered; the idea being, of course, that the despatcher will use the particular card that is best calculated to attract the attention of the person with whom he is communicating. The cards have quite an attractive general appearance; and the illustrations are good. They should therefore prove useful missionaries in the cause of the gas-steam radiator.

In view of the extended adoption of mechanical appliances for the conveyance of material in gas-works, special interest attaches to the catalogue of Temperley fixed transporters just issued by Applebys Limited, with which firm is incorporated the Temperley Transporter Company. A description is given of the transporter; and this is followed by some exceedingly well-executed illustrations of various installations of it, accompanied by particulars. One of these shows the transporter at the Wavertree works of the Liverpool Gas Company; and another an electric trolley hoist transporter at the Paisley Corporation Gas-Works. The catalogue is quite an artistic production.

We have received from Messrs. Gibbons Bros., of Dudley, a copy of a new booklet which they are issuing, dealing with constructional steelwork. This illustrates a number of steel buildings, &c., of which the firm have recently carried out the manufacture and erection. The photographic reproductions are excellent; and the first two relate to a steel and brick retort-house constructed and erected complete by Messrs. Gibbons for a large gas-works in South Wales. Elevating, conveying, and screening plants, tanks, and fire-proof flooring are among the other types of work illustrated.

There has been sent to us by Messrs. G. Hands and Co., of No. 69, Farringdon Road, E.C., a copy of a nicely got-up booklet dealing with



The Patent 'THERMO' Firefront

After a year's trial under all possible conditions over the whole country, the "Thermo" has proved itself the epoch-making invention we predicted.

The Patent 'N.V.' Gas Fire

The problem of masking the fire-opening of any ordinary coal grate by a gas stove so that the stove will seem part of the grate itself is solved by the "N.V.," as we claimed a year ago—simply, completely, finally.

We hear of piracies of both inventions being offered this year, but we rely on the Gas Authorities' sense of justice to see that—

John Wright & Co., Essex Works, Birmingham. = The original inventors reap the benefit of their enterprise and ingenuity = **John Wright & Co., Essex Works, Birmingham.**

DON'T ENCOURAGE THE PIRATES!

201.

the "Hands" lamps, both of the "Ordinary" and the "Dreadnought" pattern. These lamps are entirely British made; and the efficiency claimed for them is 125-candle power per burner for a consumption of 3 cubic feet per hour. All the working parts are interchangeable and easily accessible; while there are no glass chimneys to break, and the burners are so placed that a broken mantle cannot direct a jet of flame against the globe, and so break it. These patterns, intended for outside lighting, are stated to be absolutely weatherproof.

A new illustrated catalogue of gas-fittings, glassware, and accessories has been issued by the Wholesale Fittings Company, of Commercial Street, E., who, in addition to their own specialities, have acquired the goodwill of the Star Inverted Burner Company, whose burners and mantles they are consequently in a position to supply. The list contains numerous novelties; and also particulars relating to a cash prize distribution to customers who make the largest purchases of "Bonbac" mantles during the season from the 1st inst. to April 30 next.

Messrs. S. P. Catterson and Sons, of Newington Causeway, S.E., forward their gas-fittings catalogue for 1909-10, which contains illustrated particulars of the firm's glassware, incandescent burners, and sundries, as well as information with regard to lamps, &c., of various other well-known types.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Tuesday there was published in the "Glasgow Herald" an article, two columns in length, entitled "Light, Heat, Power," from the pen of Mr. A. Wilson, the Gas Engineer to the Corporation of Glasgow. Mr. Wilson's subject was the work of the Corporation Gas Department, some extracts from which are given. The author began with the statement that a considerable amount of surprise and incredulity is often expressed at the reported continued expansion and development of the departments and works for the supply of gas to large towns and cities, in view of the many competitors that are now in the field. Less than thirty years ago, gas consumed through flat-flame burners was the principal agent for illuminating purposes; candles and oil lamps being practically the only other means available for obtaining artificial light. At the present time, the choice of an artificial illuminant is not so limited. Electricity, petroleum, acetylene, and many forms of oil and carburetted air gas are offered to the public, and many claims are made by their suppliers as to the efficiency and economy of these various illuminants. The support given by the public to some of these systems of lighting must, without doubt, encroach materially on the business which at one time belonged almost exclusively to gas undertakings. Taking into consideration these encroachments, one need not wonder at the question being asked as to whether the demand for gas in large towns is really increasing. Figures were given, from the returns of representative undertakings, to show the vast increase—not far from being double—in the output of gas in the United Kingdom between 1888 and 1908. Then it was stated that gas lighting commenced in Glasgow in 1818, but that there is no record of the quantity manufactured until 1827, when meters were first used. In that year, the gas made was a little over 79 million cubic feet. The transfer to the Corporation took place in 1869; and figures were given showing that since then the amount expended on works and plant, less depreciation, has increased from £532,317 to £2,410,366, the gross revenue from £235,701 to £864,210, the annual make from 1,295,463,000 to 6,820,962,000 cubic feet, the number of consumers from 93,349 to 269,322, and that the price of gas has declined from 4s. 7d. to 2s. Then figures were given relating to the output of gas in the United Kingdom in 1904 and 1909, which, it was stated, proved beyond doubt that the gas business, instead of being in a decadent state, is really in a strong and vigorous condition. This fact is fully appreciated and valued at its true worth by investors in gas shares, and their confidence is proved by the published market quotations for gas stocks. The advantages of incandescent gas lighting were dwelt upon, after which it was stated that gas-cookers were another factor which had been of immense advantage to the gas authorities as well as to all classes of the community. The hiring out of gas-stoves commenced in Glasgow in 1885, in which year the number so placed was 431. In 1895, the number was 12,135; in 1905, 28,044; and in 1909, 48,548. Gas-engines using Glasgow gas numbered 632 in 1890; in 1900, 1584; and in 1909, 1690. Between 1904 and 1909 the horse power rose from 7383 to 19,003. Gas for manufacturing purposes is sold at the same price as for power—viz., 1s. 8d. per 1000 cubic feet. In 1906, the quantity used was 86,401,000 cubic feet; in 1907, 166,009,000 cubic feet; in 1908, 206,371,000 cubic feet; and in 1909, 222,756,000 cubic feet. A new source of revenue has in recent years been found among a class of consumers with whom gas departments were afraid, or did not until recently think it worth while, to do business, in the supply of gas by means of prepayment meters. Of these, there were 721 issued in 1905; in 1906, 11,100; in 1907, 27,177; in 1908, 35,446; and in 1909, 45,900. The gas consumed through these meters was: In 1906, 40,908 cubic feet; in 1907, 167,946 cubic feet; in 1908, 262,826 cubic feet; and in 1909, 297,598 cubic feet. During the last financial year, the quantity of coal carbonized amounted to 681,071 tons, costing £372,254; the quantity of coke sold was 280,116 tons, of a value amounting to £100,303; the value of the tar and ammoniacal liquor sold was £119,654; while the total wages bill for the department amounted to £229,323. Discussing the question of whether there were any prospects of further developments in the demand for gas, in addition to the natural increase due to the expansion of the city and suburbs, the author went on to state that there is not much probability in the meantime of any great reduction in manufacturing costs, and that, besides, the mere fact of reducing the gas 1d. per 1000 cubic feet (although in the total it means about £25,000 a year to the consumers) will not produce a large increase in the consumption. There ought to be, in addition to the gas used for lighting,

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201.

further large increases in the demands for power and manufacturing operations; but there is also, when compared with other cities, a practically undeveloped field in connection with the gas used for household purposes. Gas-fires and gas-heating appliances for all kinds of rooms, shops, and places of business, the heating of water for baths, lavatories, and culinary purposes, and the more extended use of gas-cookers, all offer tempting prizes in the way of increased consumption to the Gas Department, and at the same time would provide a much improved service to the public. To get hold of this new consumption, the Gas Department require to get more in touch with the consumers, and interest and educate them in the capabilities and advantages of gas, for lighting, heating, &c. The article, which ought to do much good to the Gas Department, concluded with a plea for the establishment of show-rooms for gas appliances in the principal districts of the city.

In the Greenock Town Council on Tuesday, the Gas Committee reported an increased make of gas in the month of August of over 2½ million cubic feet. In Committee, Mr. Forbes moved that the sum of £527 for new meters purchased during the year be charged to capital; and that £1077, the cost of the renewal of meters, be charged to revenue. Bailie Chalmers moved that the practice of charging the whole cost of meters to revenue be continued. The opinion of the Town Clerk was asked as to the competency of charging any part of the cost of meters or extension of mains to capital; and he stated that, under the provisions of the Greenock Gas Act of 1871, it was quite competent to charge the whole or a proportion of the cost of meters to capital, under a fair depreciation of their value; but it was not competent to charge the cost of the extension of mains to capital account. The Chairman's motion was carried in Committee, and afterwards in the Council. In submitting to the Council the gas accounts for the year, Treasurer N. M. Brown said that the estimate adopted last year provided for paying off a debit balance of £2756 of the previous year, and coming out at the close of the year with the debit balance reduced to £402; but the actual debit balance had come out at £2492. The income fell short of the estimate by £1545; and the expenditure was less than the estimate by £309. The accounts were adopted. Mr. Brown, the Convener of the Gas Committee, stated that in 1907 the number of gas consumers was 13,632, and in 1909 it was 14,281—an increase of 659. In 1907, the number of cooking appliances in use belonging to the Corporation was 1568, and in 1909 it was 2913—an increase of 1345.

The Hamilton Town Council held a special meeting on Thursday for reconsideration of the estimates and assessments, which were sent back to them by the Council at the last meeting, as mentioned in last week's "Notes." The Council possess a Municipal Buildings Fund, which has been created out of the profits in the Gas Department. The Assessments Committee on Thursday recommended that this fund, amounting to £6870, should be applied, to the extent of £6297, in liquidating the burgh debts, and that the balance be used in relief of the rates. This would allow of the rates being fixed at nearly 3d. per £1 lower than the Committee proposed at their last meeting. The proposal was adopted by the casting vote of Provost Pollock.

On Tuesday, the Water Engineer reported to the Dundee Water Committee that he had recently made an examination of the steel water-main on the Tay Bridge, and had found it wasted by corrosion. The pipe had been at work since 1887, or only 22 years, and it was evident that its life would be short compared with that of cast iron. To renew the pipe would cost about £5000; and the Engineer suggested that to meet this they might set aside any surplus they were likely to have in the future. The Committee unanimously adopted the suggestion.

The Greenock Corporation on Thursday agreed to proceed with the erection of mechanical filters to deal with 2 million gallons of water per day. It was explained by Mr. J. W. Bailey that in recent years complaints had been received regarding insufficiency of water in various parts of the town, and the fact that a torpedo factory was now being erected in the burgh was an additional reason why an effort should be made to improve the supply. After inspecting filters in a number of other towns, the Water Committee recommended that the offer of Messrs. Bell Bros., of Ravensthorpe, Yorks., for £6280, be accepted. The Council, by a large majority, adopted the recommendation.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 25.

There has again been good demand, but supplies have been sufficient to cover all requirements, and prices have been no more than maintained. The closing quotations are £11 6s. 3d. per ton f.o.b. Hull, £11 8s. 9d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. For delivery over the near months, spot prices would be paid; but makers are looking for a premium of 2s. 6d. per ton, and business does not result. For delivery over the spring months, the quotations remain £11 12s. 6d. to £11 15s. per ton, according to port, but without finding buyers.

Nitrate of Soda.

There has been no change in this market; so that 9s. 6d. and 9s. 9d. per cwt. remain the quotations for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *Sept.* 27.

The markets for tar products have been dull throughout the past week. Pitch has been decidedly depressed during the last week or ten days, and considerably lower prices have been accepted on the Continent and in England for this article. In England, 27s. 9d. has been accepted on the east coast; while on the Continent the prices at which contracts have been taken do not leave even this figure. It is reported on good authority that the Germans have been selling in Belgium for delivery to the end of June next. Creosote is dull; and as the majority of makers are well sold, they are not at all anxious for business. Benzol is steady but quiet, and there is not very much demand for it,

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except for delivery all over next year, for which sellers refuse to quote. Fifty-ninety per cent. benzol is steady; and for toluol there is a good demand, especially in the North. Solvent naphtha is steady, and makers are inclined to somewhat advance their figures. Carbolic is very weak, and Continental consumers will not offer more than 10¼d. to 10½d. f.o.b. east coast. Heavy oils are dull in sympathy with creosote. The average values during the week were: Tar, 14s. to 18s. *ex* works. Pitch, London, 28s.; east coast, 27s. 6d. to 27s. 9d.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 27s. to 27s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6¼d. to 6½d.; North, 5⅝d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¼d. to 6⅝d. Toluol, casks included, London, 9d.; North, 8¼d. to 8⅜d. Crude naphtha, in bulk, London, 3¼d. to 3⅜d.; North, 3⅛d. to 3¼d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10¼d.; heavy naphtha, casks included, London, 10¼d. to 10⅜d.; North, 9⅝d. to 9¾d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2½d. to 2⅝d. Heavy oils, in bulk, 2⅝d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 10¼d. to 10⅜d.; west coast, 10⅛d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been steady during the past week. The principal Gas Companies still quote £11 10s. upon Beckton terms; but outside makes have been sold at £11 2s. 6d., while f.a.s. London is about £11 6s. 3d. In Hull, the market is about £11 5s. to £11 6s. 3d.; and in Liverpool, £11 6s. 3d. to £11 7s. 6d. In Leith, the makers are asking £11 10s. to £11 12s. 6d. for prompt, and £11 15s. for forward; but they cannot secure these figures.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a slight improvement in the demand for coal, and the prices are a little firmer; but the output is still kept low by some local and partial stoppages. In the steam coal trade, the request is fair, and the shipments have improved in some degree. Best Northumbrian steams are steady from about 11s. to 11s. 3d. per ton f.o.b. Second-class steams are from 9s. 9d. to 10s. 3d. per ton; and steam smalls are quiet, at about 4s. 9d. to 6s. In the gas coal trade, the demand shows the more rapid growth that is usual at this time of the year. There is a good inquiry for export; and thus the production seems to be well taken up. Durham gas coal varies in price according to quality. The general classes are quoted from 10s. to 11s. per ton f.o.b., while for "Wear specials," up to 11s. 9d. is quoted. There are more sales of gas coal for forward delivery over next year, including one of second-class Durham for Italy—about 25,000 tons, at a price which is expected to leave about 10s. 2d. to 10s. 3d. f.o.b.; but this is to some extent dependent on the rate of freight that may continue. At the same time, the tendency is towards a slight advance on current values. In coke, the market is firm, and good gas coke is steady in spite of the increase of the output. The current prices for good gas coke are 13s. to 13s. 4½d. per ton f.o.b. on the Tyne or the Wear.

Scotch Coal Trade.

It is reported that some substantial sales of coal have been made, for delivery over the next twelvemonth, at prices ranging about 1s. per ton over present rates. The enhanced price, and the early period at which these sales have taken place, give countenance to the view that trade is to be better next year, both in regard to price and volume, than it has been this year. The prices now quoted are: Ell 8s. 9d. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 325,892 tons—an increase of 4795 tons upon the preceding week, but a decrease of 10,039 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,822,279 tons—an increase of 582,663 tons upon the corresponding period.

South Australian Gas Company.—At the annual general meeting of this Company, held at Adelaide on Thursday, the 26th ult., the accounts presented for the year ended the 30th of June showed that, after paying the usual dividends, writing off £7911 for depreciation, and adding £12,500 to the reserve fund, the balance carried forward was £30,160. The Directors stated that there had been a considerable increase in the expenditure for coal and wages and on renewals; but that the outlay had been met by larger sales of gas and residuals. At the Brompton works, additions to the retort-house were in progress, and a new tar-tank and sulphate store had been built. Land had been purchased at Port Adelaide, and an additional gasholder was being erected thereon. It would be necessary to provide a washer and scrubber, an exhauster, an engine, and a liquor tank at Glenelg.

New Water-Works for Skipton.—An interesting stage in connection with Skipton's new water-works scheme was reached last Thursday, when the members and officials of the Urban District Council journeyed to the reservoir at the foot of Embsay Moor, and witnessed the closing of the outlet-valve and the commencement of the storage process. The scheme has been in progress about five years, and is now nearing completion. The capacity of the reservoir will be about 150 million gallons. The cost of the undertaking is about £80,000. The Council were met on the works by Mr. C. M. Norrie, the Resident Engineer for Messrs. George H. Hill and Sons, who designed the scheme; and the ceremony of shutting off the water was performed by Mr. T. Duckett, the Chairman of the Water Committee. A few congratulatory speeches were made, and satisfaction was expressed with the quality and completeness of the entire work.

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Alliance and Dublin Consumers' Gas Company.

In their report to be presented at the half-yearly meeting on Thursday, the Directors state that the gross revenue from all sources for the six months to June 30 amounts to £153,656; the expenditure, including interest on loan capital, &c., being £121,334—leaving a balance of profit of £32,322. The Directors recommend payment of dividends of 10 and 7 per cent. per annum on the respective shares. A sum of £36,357 will be required to pay these dividends. It will therefore be necessary to draw on the reserve fund to the extent of £4035. There will then remain to the credit of the fund the sum of £39,936. The Bill which the Company promoted in Parliament has now become an Act; having received the Royal Assent on Aug. 16. Thereby the Company have been authorized: To test the gas with the No. 2 "Metropolitan" argand burner, with a standard of 14 candles. To consolidate and convert into stock the ordinary share capital, bearing a uniform standard dividend at the rate of 5 per cent. per annum. To raise additional capital by the creation and issue of consolidated ordinary stock not exceeding £300,000, and to borrow in respect of same a further sum or sums not exceeding on the whole one-third of the additional capital. The standard price of gas to be reduced from 4s. 1d. to 3s. 7d. per 1000 cubic feet. An agreement has been entered into with the Corporation of Dublin that the price in the city for three years from next January shall not exceed 3s. 4d. per 1000 cubic feet, provided there is no considerable rise in the price of coal.

Extensions at the Gosport Gas-Works.—The Gosport Gas Company have in hand some important alterations in their manufacturing and storage plant. A new three-lift holder is being constructed, and when completed the storage capacity of the works will be 230,000 cubic feet, against 77,000 cubic feet in the existing single-lift holder. The distributing plant is being extended by the laying of a main to Lee-on-the-Solent.

Exmouth Water Supply.—A meeting of the Council was held last Wednesday, to consider a proposal by opponents of the Dotton scheme. Notice had been given by Mr. Carter of his intention to move, as an alternative to the Dotton proposal, that a trial boring be carried out on the Council's land adjoining the filter-beds. The Chairman (Mr. W. C. Creedy), however, quoted a section of the Exmouth Water Act, 1900, which reads: "Provided that the Council shall not on any of the said lands sink any well or bore or construct any works whatever for the purpose of collecting or abstracting underground water." He therefore ruled Mr. Carter's motion out of order. It was argued by some of the members that, as the land indicated in Mr. Carter's motion had been purchased since the Act was passed, it was not included in the proviso. The Chairman said that the purchase was made under the Water Act, and all the land in connection with the water-works was held on the same terms. He, however, hoped Mr. Carter would find a way of giving effect to his opinion that a supply of water could be obtained from the source indicated in his resolution.

Nuisance from an Electricity Works.

Some of the inhabitants of Torquay have been moved to approach the Local Government Board with the object of obtaining abatement of the nuisance caused by the municipal electricity works. Their action is not to be wondered at; the situation of the works is very unsuitable. On the one side is the Bath Saloon, the chief place of assembly in the town; and on the other is residential and business property of high rateable value. Four or five years ago, the Corporation came to the conclusion that the buildings, which had been put up for another purpose, were no longer suitable for use as an electricity station; and in view of a great expected development in connection with a tramway scheme, application was made for sanction to borrow £42,000 for the erection and equipment of another electricity works on a less conspicuous and a more suitable site. The Local Government Board decided against this proposal, on account of its extravagance; and the Corporation have since muddled along in the old station, cramming more machinery into it, and apparently producing a condition of things which residents in the vicinity find intolerable. Mr. A. A. G. Malet, who visited Torquay on Friday to investigate the causes of complaint on behalf of the Local Government Board, suggested that there was not much to complain of in the way of noise, as there was nothing more than a steady buzz of the machinery. The complainants' reply was that the continuance of the noise and vibration at night got on the nerves of visitors, who either went away prematurely or, if they stayed, complained, and so gave the neighbourhood a bad name. Another cause of annoyance was the smoke emitted from the chimney of the works; and there were also sulphur fumes and dust from the furnace ashes. The Town Clerk and the Chairman of the Electricity Committee (Mr. Blackler) put the best face possible on matters. A good deal of money, it seems, has been spent in endeavours to abate the smoke nuisance; and more effort is to be made in the same direction. One suggestion of the Corporation is that the chimney of the works shall be increased in height; but the people in the neighbourhood are opposed to this, because a big chimney will be an eyesore. Beyond getting promises that as much as possible shall be done to meet their wishes, the objectors to the nuisance do not seem to have gained much by their petition. The ultimate effect will no doubt be to stimulate the Corporation to fresh action in the provision of a more suitable generating station. Indeed, there was more than one hint of a possible move in this direction, which certainly seems desirable in the interest of the town.

In the course of the Budget statement made by Mr. Wall, the Treasurer of Victoria, in the Legislative Assembly last Wednesday, he mentioned the extensive deposit of coal found on the Powlett River as one of the most important discoveries of recent years. He said 25 million tons of coal of excellent quality had been proved; and there were well-defined thick seams underlying eight square miles. A Bill authorizing the establishment of a State colliery is to be introduced shortly.

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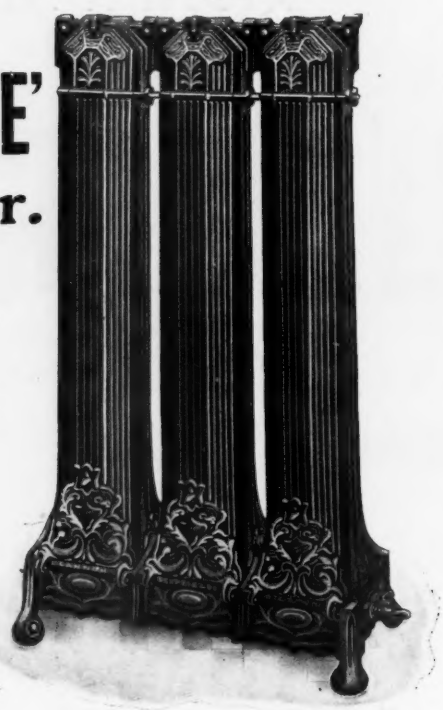

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Theft from a Gas-Meter at Beckenham.

At the Bromley Police Court, on Monday last week, Frank Lawrence, a youth, with no home, was charged with feloniously breaking and entering the shop at 7, Trinity Road, Beckenham, between the 4th and 6th inst., and stealing a loaf of bread, the property of Clara Mack, and at the same time and place 2s. 6d. cash, the property of the South Suburban Gas Company. Henry Moss, a meter inspector in the service of the Company, said he examined the meter, and found only 1d. in the money-box. On calculating the quantity of gas used since the money was last collected, he reckoned that 2s. 6d. worth of gas had been burnt. Prisoner denied taking the money, but pleaded guilty to taking the loaf. Detective Ward stated that the prisoner was convicted at the Court of begging in March, 1908. He was put into the care of the Court Missionary, and sent out to Canada, but returned by the same boat. He was a persistent petty thief, and they could not believe anything he said. He had twice broken open his mother's gas-meter, and this had been overlooked. His mother left the neighbourhood so as to be away from him. Accused was sentenced to fourteen days' imprisonment.

Serious Gas Explosions in Manchester.

A house in Plymouth Grove, Manchester, was partly wrecked by an explosion of gas last week, and Mr. Thomas Chappell, the occupier, and a friend were injured—the former so seriously that his removal to the Royal Infirmary was deemed necessary. An escape of gas had been detected in one of the rooms, and the two men proceeded to locate it. As soon as a match was struck there was a violent explosion, which shook the whole house, wrecked the windows, forced doors from their hinges, and damaged the ceilings. The apartment in which the explosion occurred was set on fire; but the flames were soon extinguished. Mr. Chappell was burnt about the face and upper part of his body; but his companion escaped with very slight injuries. After surgical treatment at the Infirmary, Mr. Chappell was well enough to be taken home. An explosion of gas at a corner shop in Openshaw, Manchester, last Wednesday resulted in six or seven of the windows being blown out of their frames, and some damage caused to the walls. A servant girl had been boiling water on a gas-stove, and the explosion seems to have taken place when she turned off the gas. Taps inside the stove were turned on while the outside jets were being used; the result being an accumulation of gas inside. The girl sustained slight injuries.

Shortage of Water at Leicester.—In spite of the rainy summer, the water reservoirs of the Leicester Corporation show a deficiency of more than 1000 million gallons. So serious has the position become that the supply, which has been restricted for several weeks, will probably be still further limited unless there is a heavy rainfall in the near future. During the past month, the stock of water in the reservoirs has decreased 80 million gallons.

Paignton Water-Works Settlement.

The terms proposed for the settlement of the dispute between the Paignton District Council and the Contractors for the water-works (Messrs. Hawkings and Best), were considered at the last meeting of the Council. Mr. Parnell, the Chairman, when moving that the Contractors be paid £10,000 in full discharge, said the settlement was one that must be regarded as satisfactory. The contract price for the dam and works on Dartmoor was £22,555; but by the time the work was finished, the extras amounted to £29,000, and in addition they received a claim from the Contractors for £40,000—making in all a sum of about £90,000. The matter was referred to arbitration; and after the Court had been sitting for two days, an offer was made on behalf of the Council of £10,000, which was not entertained. When the arbitration had been proceeding for a fortnight, a question arose as to what were the functions and duties of the Engineers; and the proceedings were adjourned with a view to getting this point decided in the High Court. In the meantime, efforts had been made to effect a settlement; and these resulted in a conference at which the agreement now presented for confirmation was arrived at. It was a subject for congratulation that the dispute was thus ended; for if the litigation had continued, it would probably have extended over eighteen months or two years, and £6000 would have been swallowed up in law costs. Mr. Sarson, to whose sagacious diplomacy in arranging the settlement the Chairman paid a tribute, expressed the opinion that the terms agreed upon were eminently satisfactory from the Council's point of view, and would leave no ill-feeling behind on the part of the Contractors. The Chairman explained that it was anticipated that a loan would be sanctioned for the amount now required to settle their liability with regard to the water-works. They also hoped that before long they would get the period of repayment of the loan extended to sixty years. A resolution approving of the settlement was carried; and the Clerk was instructed to take the necessary steps for obtaining the Local Government Board's sanction to a loan.

Town Lighting by Acetylene in France.—In one of the "Notes on Gas Lighting" in the current number of the "Ironmonger," reference is made to a communication by M. L'Hermite to the "Revue Générale de l'Acétylène," to the effect that four more French communes—viz., Hangest-en-Sauternes (Somme), Ry (Seine-Inférieure), Lieurey (Eure), and Boissy-le-Sec (Eure-et-Loire)—are deciding on the adoption of acetylene lighting. M. L'Hermite is a mechanical constructor at Louviers, and has specialized in the lighting of towns by acetylene. The writer of the note says it seems very probable that the extensions which are being made in this direction are due not only to the progress made from the mechanical and scientific side, but also to the fall in the price of carbide. But whether the hopeful predictions of the "Revue" that the towns lighted by acetylene in France will be counted by hundreds instead of by tens will be realized, remains to be seen.

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LEST YE FORGET.

Alleged Artful Theft.

Alfred John Bosher, aged 26, a gas engineer, of Mildmay Grove, Stoke Newington, was last week charged on remand at the Old Street Police Court with being a suspected person, loitering for the purpose of committing a felony. He was also further charged with stealing from an automatic gas-meter inside No. 21, Leopold Buildings, the sum of 12s., the money of the Gaslight and Coke Company. Mr. Humphreys prosecuted, and said the case was one of grave suspicion. The prisoner had hitherto borne an irreproachable character; but so far as the prosecution had been able to ascertain, the tale he now told was quite untrue. At the previous hearing, the prisoner (who was found by a resident in the buildings and handed over to the police) had told several stories, all of which would be disproved. Ada M'Hugh deposed that she saw the prisoner in some rooms in the building; and when questioned by her, he said he had just taken them. This the caretaker denied. Police evidence showed that, when arrested, the prisoner was found in possession of a number of keys, three of which fitted gas-meters in rooms in the building. The other keys were identified by the prisoner's wife as belonging to the house in which she lived with the prisoner. In answer to the Magistrate (Mr. Cluer), she said that when her husband left her on the Saturday evening in question he had 1s. in silver and twelve pence which she had given him. The Magistrate: How much was found on the prisoner? Detective Pearce: Four shillings—three in silver and twelve pence. The Magistrate: Well, that is in the prisoner's favour somewhat. He is charged with stealing 12s. An official of the Gaslight and Coke Company said the index to the meter showed that 12s. should have been in the box. Prisoner, who said he was not guilty, was committed to the Sessions.

Novel Point as to Water Charges.—A peculiar question as to charges for water has arisen at Tiverton. The town is in the happy position of having free water—an unconditional gift to the town by ancient Charter. In recent years, owing to the growth of the population, this supply has had to be supplemented from another source. Consumers have been charged for this new supply; but as the water from both sources flows into the same mains, difficulties have occasionally arisen as to the manner in which the charges should be apportioned when made. In some cases, a charge of £5 or £10 has been made for the connection, and the water has been supplied free; while in others, a yearly sum has been paid. At the last meeting of the Town Council, application was received from a laundry owner who has been paying £1 a year for a number of years for relief from this tax. Some of the members were in favour of remitting further payment; but others argued that as the water was used for trade purposes it should be paid for. They said that if water were supplied free in this case, it would be difficult to get the builders and brewers to pay for it. In the end, the matter was referred to a Committee for consideration; it being urged that, as the rates are 6s. 9d. in the pound, it was undesirable to impose further burdens on the ratepayers at large.

Improved Public Lighting in Wandsworth.—The Highways Committee of the Wandsworth Borough Council have had under consideration letters from the South Metropolitan Gas Company with regard to street lighting. Last February, the Company suggested that the lanterns and burners for new erections should be taken from existing lamps at the corners of some of the principal streets, and replaced by the Company's latest inverted burner lamps, each of which gives 50 per cent. more light at the same cost. The extra charge per lamp would be 3s., to cover the cost of labour; the cost of the lantern and burner being borne by the Company. In April, the Company informed the Council that a new inverted burner had been fitted in front of the Council House, and that their Superintendent of Lighting would attend at any time to explain its working, consumption, &c. In July, the Company wrote to the effect that the charges for public lighting would be reduced as from Midsummer last to the following figures: No. 2 burner lamps, £2 8s. 3d.; No. 3 burner lamps, £2 15s. 6d.; and No. 4 burner lamps, £3 2s. 10d.; that the charge for the new inverted burner would be reduced to £2 19s. 6d. per lamp per annum; and suggesting that the No. 3 and No. 4 burners should be replaced by those of the new inverted type. The Committee have given directions for the new burner to be fitted to twelve of the existing lamps at the corners of principal streets; and they will later report thereon to the Council.

Street Lighting at Weybridge.—The Walton-on-Thames and Weybridge Gas Company having stated their willingness to renew the contract for the public lighting of Weybridge on the same terms as at present, the Highways Committee of the Urban District Council wrote to them expressing the opinion that there ought to be a reduction in the price, seeing that a great number of new lamps had been erected, and that the charge to ordinary consumers had been lowered. The Company replied that for one year's lighting they were unable to quote less than £2 14s. per lamp; but for a three years' contract they would offer a 2s. reduction, making the charge £2 12s. Referring to the statement that, as the price of gas to ordinary consumers had been reduced, they considered the rate per lamp should be reduced also, the Company pointed out that when they had been compelled to raise the charge for gas, owing to the great advances in the price of coal which had taken place in recent years, they had not increased the price to the Council for public lighting. The Committee also received an offer from the local Electric Lighting Company to fit up with 50-candle metallic filament lamps, and light the whole of the street-lamps in the district for the sum of £2 17s. per lamp per annum on a five years' contract. This price was exclusive of the cost of painting. On the 215 lamps, electricity showed an excess of £54 over the reduced terms of the Gas Company. When the matter came before the Council, Dr. Willson remarked that one advantage of gas-lamps was that, even when they were put out, the bye-pass afforded some indication to drivers of vehicles as to which side of the road they were on. As he did not suppose gas was likely to get much cheaper, he proposed that the Company's offer of a three years' contract should be accepted. This was carried unanimously.

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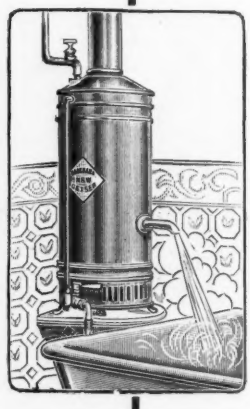

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Tar-Spraying of Roads Vetoed at Ilfracombe.—At a special meeting of the Ilfracombe Urban District Council last Tuesday, the Works Committee reported that they had resolved to recommend that provision be made in the forthcoming estimate for the sum of £100 to be expended in a scheme of tar treating the surface of certain of the main roads—this sum to include the cost of a tarring-machine which the Committee suggested should be purchased. They expressed the opinion that a similar sum should be provided in the March, 1910, estimate. The recommendation gave rise to considerable discussion. Mr. Drake said the scheme the Committee submitted was quite different from that adopted in regard to High Street this year. The tar was simply put on with a brush; but they proposed, with the aid of the machine, to put it on at a pressure of 100 lbs. per square inch. Several members favoured tar macadam, and thought that if the Committee's recommendation was carried out it would simply be a waste of money. A motion that the report be adopted was lost by one vote.

At the forthcoming meeting of the Imperial Continental Gas Association, the Directors will recommend the declaration of a dividend of 4 per cent. for the half year ending the 30th of June.

At a recent meeting of the Heywood and Middleton Water Board, it was stated that the expenditure on the new reservoir at Ashworth Moor totalled £240,038; this sum including £47,392 for land and interest during construction, but excluding £3296 spent on plans.

The most important item in the import trade of Hawaii from the United Kingdom is that of chemicals; and practically the entire import under this heading is sulphate of ammonia, which is largely used on the sugar plantations. The actual value of the chemicals imported from the United Kingdom during 1908 was £62,537.

Spontaneous combustion was the origin of the ignition of a stock of 20,000 tons of coal at Coatbridge a few days ago; and the fire obtained such a hold that it rapidly appeared that the whole stock was doomed. The coal had been stored by Messrs. Stewarts and Lloyds, as provision against the possibility of a miners' strike.

Including £4464 brought forward, the profit of Messrs. Sadler and Co., Limited, for the year ended June 30 was £27,431. The Directors recommend the payment of a dividend of 5 per cent., the placing of £5000 to reserve (making this fund £10,000), and the carrying forward of £3668. During the year, £3903 was expended out of revenue on works improvements, &c.

A singular difficulty has arisen in connection with the lighting of the parish church of Billingborough, in Lincolnshire. Owing to non-payment of the account for gas consumed, the supply has been cut off at the instance of the Gas Company. There are no other suitable means of lighting the church at night; consequently evensong is now being held in the afternoon.

It is reported that the ballot of the members of the thirteen Unions of the engineering and kindred trades in Manchester and district has resulted in the acceptance of the proposal that the present rates of wages shall remain undisturbed for a period of three years from the 30th inst., and that any subsequent alterations in rates of wages shall be subject to two months' notice.

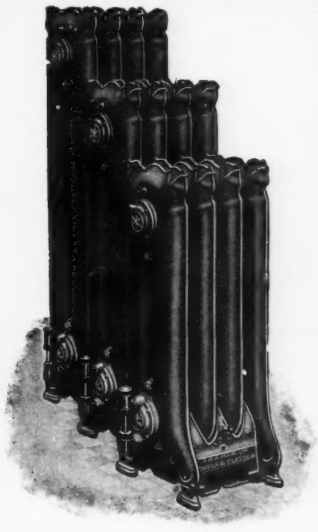
According to the "Calcutta Times," in Siam, when the electric light goes out, the remedy is simple, as shown by the following notice: "Bangkok. Sir, for the case that your electric light should fail, we beg to send you enclosed a post-card, which please send us at once when you find your light out. The Company will then send you another post-card.—Yours truly, Manager, Siam Electricity Company, Limited."

The accounts of the Glenboig Union Fire Clay Company, Limited, for the year ending Aug. 31, after providing for maintenance of works and for current charges, and including £2180 brought in from the previous year, show a gross profit of £18,473. The Directors recommend that £3500 be allowed for depreciation, and £1500 for writing-down the cost of new electric plant. A dividend at the rate of 8 per cent., free of income-tax, will allow a balance of £1473 to be carried forward.

APPLICATIONS FOR LETTERS PATENT.

20,904.—Price, H. S., "Fluid meters." Sept. 13.
20,949.—Dempster, R., and Sons, Ltd., and Horsfall, J. E., "Gasholders." Sept. 14.
20,952.—Milne, J., and Alexander, W., "Prepayment meters." Sept. 14.
20,989.—Schönfeldt, F., "Locking cash-receptacles to coin-freed gas apparatus." Sept. 14.
21,003.—Graf, A., and Smyth, F. W., "Gas for lighting, heating, and power purposes." Sept. 14.
21,010.—Dr. C. Otto and Co. G. m. b. H., "Recovery of bye-products from gases derived from combustibles." Sept. 14.
21,033.—Fischer, J., "Gas-controlling devices." Sept. 14.
21,078.—Ehmann, C. P., "Preventing back-lighting in atmospheric gas-burners." Sept. 15.
21,096.—Robus, G. H., "Gas-heated irons." Sept. 15.
21,118.—Kindermann, J., "Exhaust-gas purifiers." Sept. 15.
21,126.—Blake, E. W., "Controlling the supply of gas to burners." Sept. 15.
21,171.—Wyler, B. F., "Gas-heating apparatus." Sept. 16.
21,236.—Breeden, J., and Co., Ltd., and Breeden, F., "Gas-lamps." Sept. 17.
21,358.—Stewarts and Lloyds, Ltd., and Ballantyne, R., "Fitting branch service connections to main-pipes." Sept. 18.
21,362.—Reynolds, J. G., "Gas heaters or stoves." Sept. 18.
21,366.—Still, E. H., "Incandescent gas-lamps." Sept. 18.
21,368.—Booth, H. C., "Hydrocarbon gas-plants." Sept. 18.
21,369.—Cambridge Scientific Instrument Co., Ltd., and Whipple, R. S., "Radiation pyrometers." Sept. 18.
21,375.—Genteur, D. A., "Manufacture of carburetted air." Sept. 18.

RADIATORS



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Last Sunday week, there was a trifling explosion at the Cambridge Gas-Works, by which two of the workmen were cut about the arms and face. The men are stated to have been fixing a glass in a hydraulic main, when the explosion (which was caused by one of the tar take-offs of one of the beds of retorts becoming partially stopped, preventing the pipes being sealed) occurred. The glass was splintered, and both men received a number of cuts. They came down the ladder unassisted; and first-aid was rendered by a fellow workman. They were then removed to the hospital, where their wounds were dressed.

While the value of coke as an auxiliary fuel in the household has been acknowledged ever since it came to be produced in considerable quantities in the process of gas manufacture, it is only comparatively recently that it has been brought within reach of the poorest classes of the community. Owing to the occupants of apartments in tenement houses, and even of West-end flats, not being able to find room for the amount of coke usually sent out by coal and coke merchants, it occurred to Mr. Corbet Woodall, the present Governor of the Gaslight and Coke Company, that these people might be served with small quantities delivered in paper bags. The system was highly successful, as shown by the results of three months' working in the case of the Tottenham and Edmonton Gas Company, of which Mr. Woodall is Chairman, furnished by Mr. A. E. Broadberry, the Engineer and Manager, to Mr. Robert Watson, of Doncaster, and included in the paper on "The Make and Sale of Coke" read by him at the meeting of the Manchester District Institution of Gas Engineers early in the year. On that occasion, Mr. Broadberry sent for inspection a sample of the bag he has in use, and gave the cost per 1000 printed. It seems only in the natural order of things, in view of the extraordinary extension of the "penny-in-the-slot" system of selling gas, that there should be a good field for the sale of small quantities of coke; and when this can be conveniently done, as we are reminded is now possible, in 28lb., 14lb., and even 7lb. bags, it seems scarcely necessary to direct the attention of gas managers to the facilities thus afforded for increasing their returns from this residual.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. Oct. 12.
LOWESTOFT WATER AND GAS COMPANY. Oct. 12.
SOUTHEND WATER COMPANY. Oct. 12.

TENDERS FOR

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BRIGHOUSE GAS DEPARTMENT. Tenders by Oct. 9.

Fires and Cookers.
SKIPTON GAS DEPARTMENT. Tenders by Oct. 6.

Oxide of Iron (New and Spent).
CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by Oct. 2.
SALFORD GAS DEPARTMENT. Tenders by Oct. 7.
TEIGNMOUTH GAS DEPARTMENT.

Waggons.
STOURBRIDGE GAS DEPARTMENT. Tenders by Oct. 12.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 811.

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298,955	10	,,	7	Do. 7 p.c.	12⅞—13¼	..	5 5 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.	5⅞—6	..	5 8 4
40,000	5	,,	6½	Do. New, £4 paid	4⅛—4⅜	..	5 9 6
50,000	10	Aug. 26	15	Bourne- } 0 p.c.	28—28½	..	5 5 3
311,810	10	,,	7	mouth Gas } B 7 p.c.	16½—17⅝	..	4 3 7
75,000	10	,,	6	and Water } Pref. 6 p.c.	15⅜—15⅝	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	252—255	..	4 18 0
300,000	,,	,,	9½	Do. New	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	208—213*	..	5 3 3
246,320	,,	,,	8	Do. A Ord. Stk.	150—152*	..	5 5 3
460,000	20	Apl. 16	10	British	43—43¾	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118—120	+1	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88—90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
51,000	,,	June 25	3½	Do. 3½ p.c. Deb.	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13⅞—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	4⅛—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	5⅛	Commercial 4 p.c. Stk.	105—110	..	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do.	104—105	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
145,995	,,	Mar. 31	5	East Hull 5 p.c. Ord.	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd.	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅝	Gas } 4 p.c. Ord.	105⅝—106½	..	4 7 7
2,620,000	,,	,,	3½	light } 3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Coke } 3 p.c. Con. Deb.	85—87	—½	3 8 11
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92—94*	..	5 6 4
82,500	,,	,,	6½	Do. do. 5 p.c.	117—119*	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½—18½	..	6 0 7
131,070	Stk.	Sep. 10	6½	Ilford A and C	138 —140*	..	4 12 10
65,780	,,	,,	5	Do. B	105—107	..	4 13 6
65,500	,,	June 25	4	Do. 4 p.c. Deb.	102 —104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental	178—180	—1	4 8 11
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	119—121	..	4 19 2
561,000	Stk.	,,	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. B	165—167	..	4 3 10
306 083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅝—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of } 5 p.c. Deb.	102—105	..	4 15 2
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3⅜	Monte Video Ltd.	12⅜—13½	..	5 5 8
1,775 892	Stk.	July 29	4½	Newc't.e & G'tesh'd Con.	107—108	..	4 3 4
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 15 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13¼	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd.	6—6⅛*	..	6 8 0
3',800	53	Aug. 26	13	Portsea Island A.	137—139	..	4 19 0
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	120—123	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord.	7⅛—7⅛	+⅛	4 15 9
796,583	5	July 29	5	Do. 5 p.c Pref.	5¼—5⅜	..	4 10 11
488,902	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord.	16⅝—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd.	14⅜—14⅝	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref.	12 —12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½	..	4 19 0
135,000	Stk.	Sep. 10	10	Sheffield A	230—232*	+1	4 6 2
209,980	,,	,,	10	Do. B	229—231*	..	4 6 7
523,500	,,	,,	10	Do. C	229—231*	..	4 6 7
720,000	10	June 11	10	South African	13⅜—14	..	7 2 10
6,439,895	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	85—87	+½	3 8 11
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord.	111—113	..	4 8 6
120,000	Stk.	Aug. 12	6⅝	Tottenham } A 5 p.c.	133—135	..	5 1 9
453,940	,,	,,	5⅛	and } B 3½ p.c.	111—113	..	4 15 3
149,470	,,	June 25	4	Edmonton } 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9⅜	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,676	Stk.	Aug. 26	6⅝	Wands- } B 3½ p.c.	139—141	+1	4 14 0
79,416	,,	June 25	3	worth } 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅛	West Ham 5 p.c. Ord.	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref.	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk.	112—114	..	3 13 2

Prices marked * are "Ex div."

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

"HALLITE" Asbestos High-Pressure Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

METER INDICES
WITH AND WITHOUT DIALS.
A. ROUX & CO., Limited,
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

GAS TAR wanted,
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

APPLY TO THE
CHAIN BELT ENGINEERING CO.
DERBY, ENGLAND,
FOR REALLY HIGH-CLASS
ELEVATORS AND CONVEYORS
ALSO
DRIVING AND CONVEYOR CHAINS.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

"FORTO" Incandescent Gas Mantles Combine Brilliancy and Strength. British Made. Send for List.
ISAAC EALES AND CO., 40, Howard Street, BIRMINGHAM.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOgovernors.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
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OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
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DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON,
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
39, VICTORIA STREET, S.W.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement Sept. 7, p. 664.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT, LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

OXIDE OF IRON.

(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

LUX'S GAS PURIFYING MASS.
See Advertisement on p. 795.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, June 22, p. VI. of Centre.
ALDRIDGE AND RANKEN,
33, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

APPLICATIONS for Appointments arranged effectively. Greatly appreciated by Recipients. Numerous unsolicited Testimonials. Write Now for Particulars.
HERBERT GREATOREX, Upper Hackney, MATLOCK.

MR. WM. CRANFIELD, F.C.S., in response to requests, has decided to extend the work he has been carrying on by Gas Classes in various Yorkshire Towns for the past Ten Years, and to organize postal courses of Tuition in "Gas Engineering" and "Gas Supply." Close personal attention will be given to the needs of each individual Student, and Expert Assistance has been engaged. All Inquiries treated confidentially.
Full Particulars on Application to No. 11, Avondale Place, HALIFAX.

CORRESPONDENCE CLASSES.
GAS Engineering and Gas Supply.
City and Guilds of London Institute.
Teacher: HERBERT LEES (Silver Medallist), Assoc.M.Inst.C.E., Engineer and Manager of the Hexham Gas Company, Lecturer at Rutherford College, Newcastle-on-Tyne.
For Terms, &c., address ELVASTON ROAD, HEXHAM.

THE UNIVERSITY OF LEEDS.
DEPARTMENTS of Gas Engineering and Fuel and Metallurgy and Civil, Mechanical, Electrical, and Mining Engineering.
The work of these Departments is carried on in Separate Blocks of Buildings specially equipped for Systematic Instruction. Prospectus may be had free on Application from the Registrar.
The next Session begins on Oct. 5, 1909, on which day the entrance Examination will be held at Ten a.m. and Two p.m.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

RECORDS—CITY AND GUILDS.

THIS Year, our Students in Honours Gas Engineering took over one-third places in First-Class and Silver Medal. Six Medals and 80 Passes in last Two Years. Courses starting in Gas Engineering and Supply, &c. Have you a Copy of our Success Book, describing our Special Individual System? No more Failures.
Correspondence College Company, Dept. B., 26, Green Street, Cambridge.

MR. W. B. MIMMACK, for many years Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SITUATION wanted by a Man well up in Public and Private INCANDESCENT LIGHTING. Country preferred. Age 34. Active.
Address No. 5140, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ASSISTANT ENGINEER AND DRAUGHTSMAN.

YOUNG Engineer (25) Desires Re- Engagement, at Home or Abroad. Varied and up-to-date Practical and Theoretical Experience in Works, Offices, and Erection. Good Draughtsman. Moderate Salary. Good Testimonials. Can commence duties at once.
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WANTED, at once, a Good Fitter, for about Six Weeks, to Lay 3-inch and 4-inch Mains and Services.
Apply, with Reference, to S. Bark, Manager, Gas-Works, Sunbury-on-Thames.

SECOND-HAND Station Meter by Parkinson FOR SALE. Capacity, 20,000 Cubic Feet per Hour. Cylindrical Tank, fitted with Clock and Tell Tale. First-Class Condition. Just thoroughly Overhauled.
Address No. 5137, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GASHOLDERS—Splendid, 45 feet dia- meter, and New STEEL TANK fixed complete, to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS. Can be seen temporarily erected.
Firth Blakeley's, Thornhill, Dewsbury.

PURIFIERS—Set of Four, 12 feet Square, fixed complete. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.
Firth Blakeley's, Thornhill, Dewsbury.

THE Coventry Corporation have For SALE, owing to the Dismantlement of their old Gas-Works, the following GAS APPARATUS:—
One Two Million Cubic Feet per diem LIVESEY WASHER, 10 ft. by 8 ft. by 3 ft. 6 in. deep, with 18-inch diameter Connections.
Two Sets of Morris and Cutler's Water-Tube CONDENSERS, each of a Capacity of 750,000 Cubic Feet per diem, with 14-inch diameter Connections and Disc Valves.
Three Batteries of Marshall's Water-Tube CONDENSERS, of a Capacity of Two Million Cubic Feet per diem, with 18-inch diameter Connections and Valves.
Two Dempster's Reciprocating EXHAUSTERS, with STEAM-ENGINES on Same Bed Plate, Steam Governors, and Connections, and Disc Valves. One Set 60,000 Cubic Feet per hour, and the other 100,000 Cubic Feet per hour Capacity.
Further Particulars and Prices may be obtained from the undersigned.
Fletcher W. Stevenson,
Engineer and Manager.
Gas-Works, Coventry,
Sept. 22, 1909.

THE Cleator Moor Urban District Council invite TENDERS for the Supply of 80 Tons of OXIDE of IRON, delivered at Cleator Moor Gas-Works.
Endorsed Tenders to be sent to the undersigned on or before Oct. 2, 1909.
Henry Rothery,
Clerk to the Council.
Public Offices, Cleator Moor,
Sept. 21, 1909.

BOROUGH OF BRIGHOUSE.
(Gas Department.)

THE Gas Committee are prepared to receive OFFERS for 1500 Tons of Surplus COKE (best forked) for disposal from their Mill Lane Gas Works, Brighouse, during the Six Months ending the 31st of March, 1910.
Tenders, endorsed "Coke," to be addressed to the Town Clerk, Municipal Offices, Brighouse, on or before the 9th of October, 1909.
Tenders are to state Price per Ton loaded at the Gas-Works, and full Particulars of the Loading Charges to either Railway or Canal may be had on Application to
Harold Davies,
Engineer and Manager.
Gas-Works, Brighouse,
Sept. 28, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.
(Gas Department.)

OFFERS are invited for the Supply of 60 Tons of OXIDE OF IRON for Gas Purification.
Prices, f.o.r. Teignmouth, and full Particulars to
J. Alex. Gray,
Gas Manager.

URBAN DISTRICT COUNCIL OF STOUR-BRIDGE.
(Gas Department.)

THE Gas Committee invite Tenders for Ten 10-Ton RAILWAY WAGGONS.
Specification and all Particulars on Application to the undersigned.
The lowest or any Tender not necessarily accepted.
Latest day for Tenders, Oct. 12.
Charles H. Webb,
Engineer and Manager.
Gas-Works, Stourbridge,
Sept. 25, 1909.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the Purchase of about 1600 Tons of SPENT OXIDE.
Full Particulars and Form of Tender may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Spent Oxide," to be delivered to me not later than Three p.m. on Thursday, the 7th of October, 1909.
L. C. Evans,
Town Clerk.
Salford.

SKIPTON URBAN DISTRICT COUNCIL.
(Gas Department.)

THE Council invite Tenders for the Supply of GAS FIRES and COOKERS required during the period ending the 30th of June, 1910.
The average number Purchased during each of the past Four Years was 167.
Further Particulars may be obtained from Mr. J. H. Woodward, Manager, Gas-Works, Skipton, and Tenders, endorsed "Gas-Cookers," are to be sent to him on or before the 6th of October, 1909.
Richard Wilson,
Clerk to the Council.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
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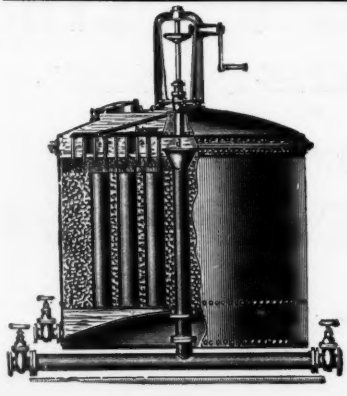

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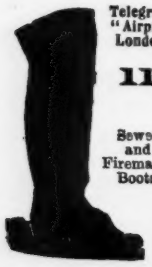

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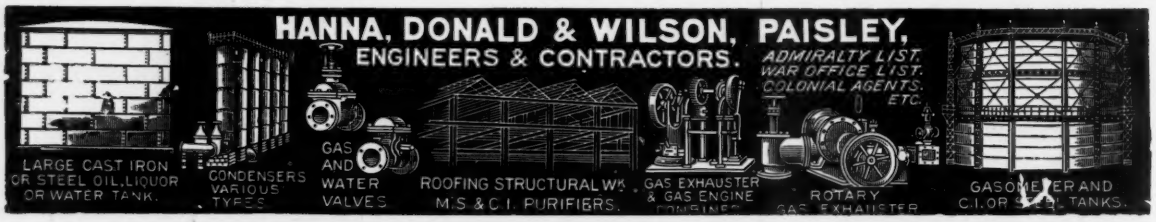

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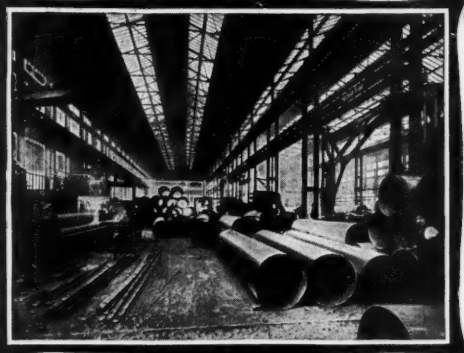

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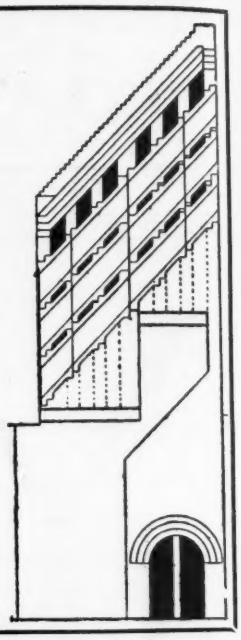

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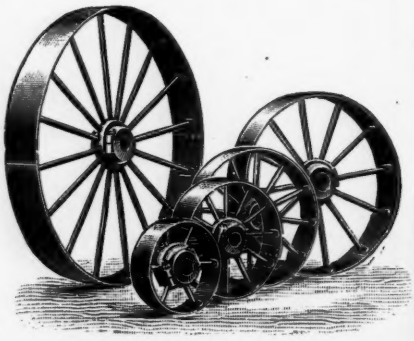

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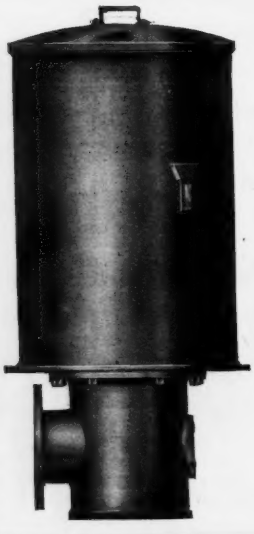

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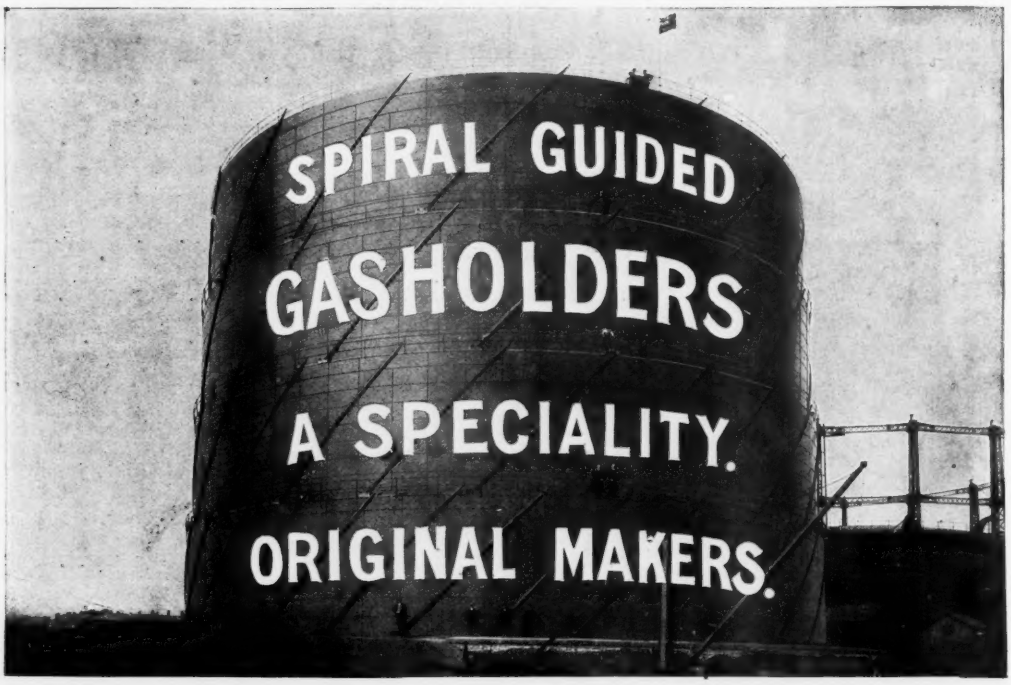

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Inverted Arc Lamp, Fig. 623.

Storm Proof—

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Welsbach-Kern

(Patent) Inverted System

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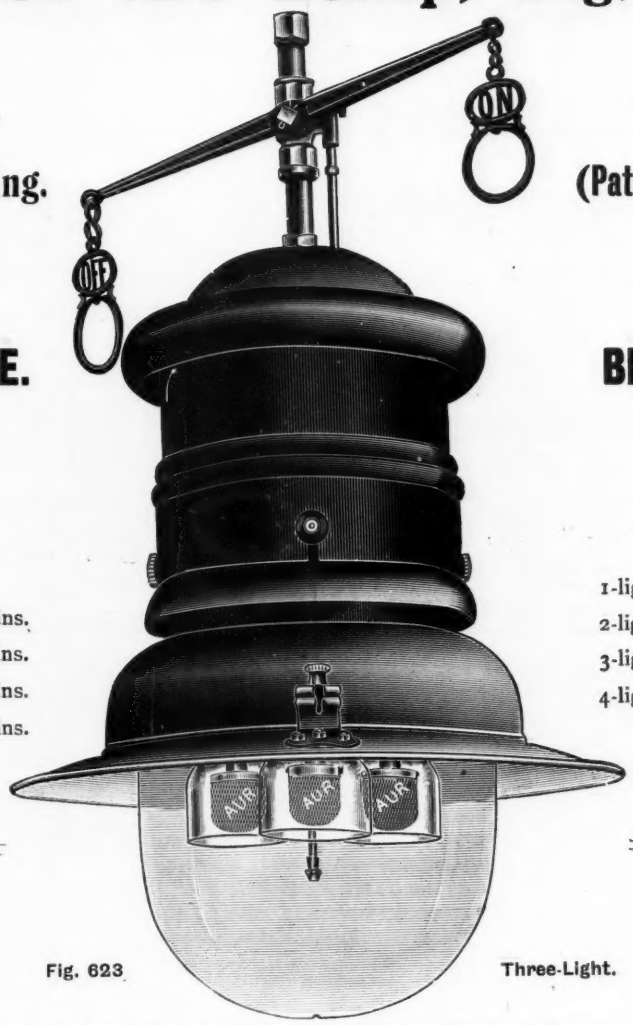

Fig. 623 Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.
3-light	12 feet	400	**52/6**	**6/-** extra.
4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

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Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

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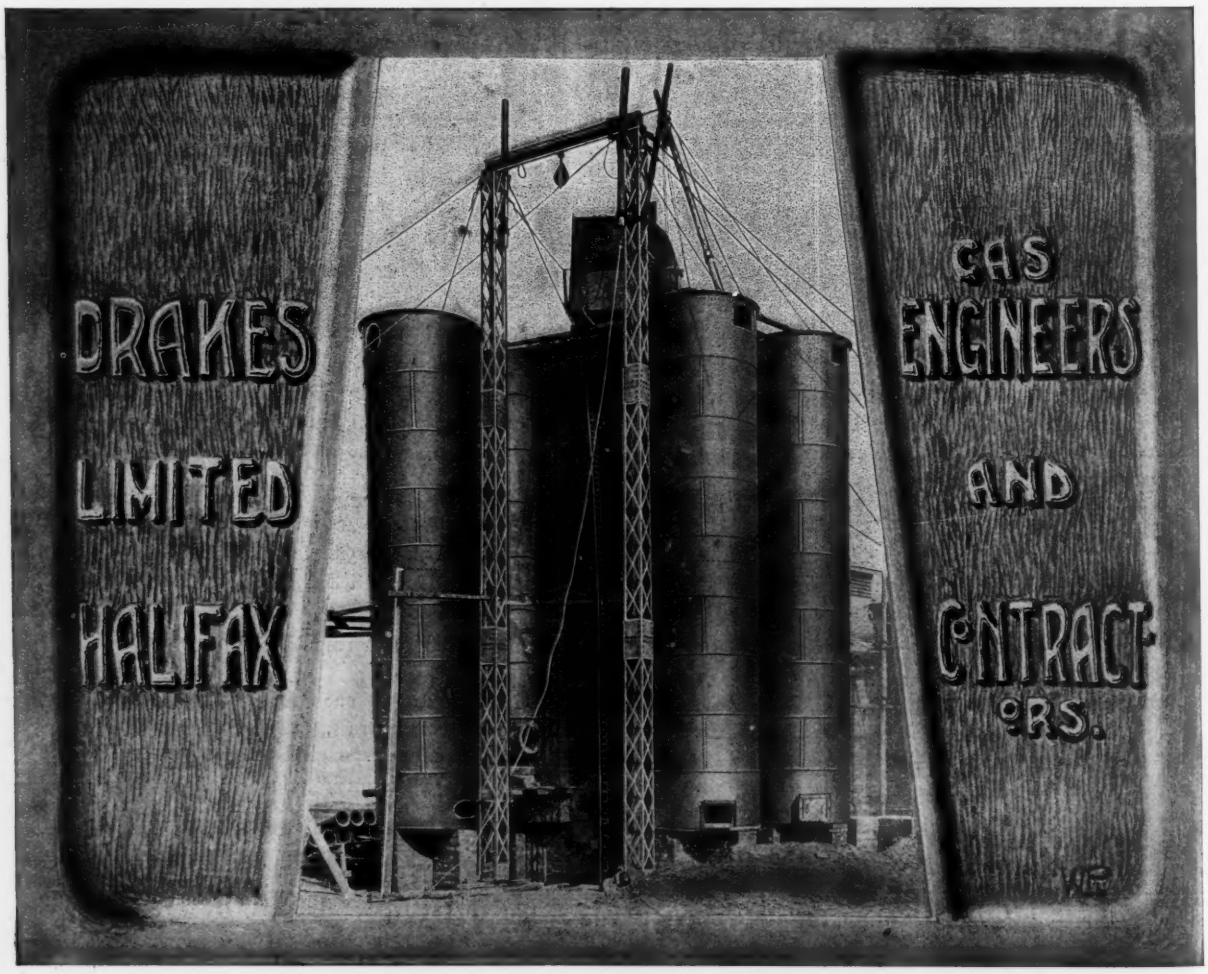

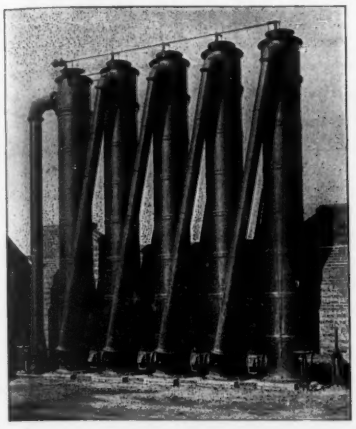

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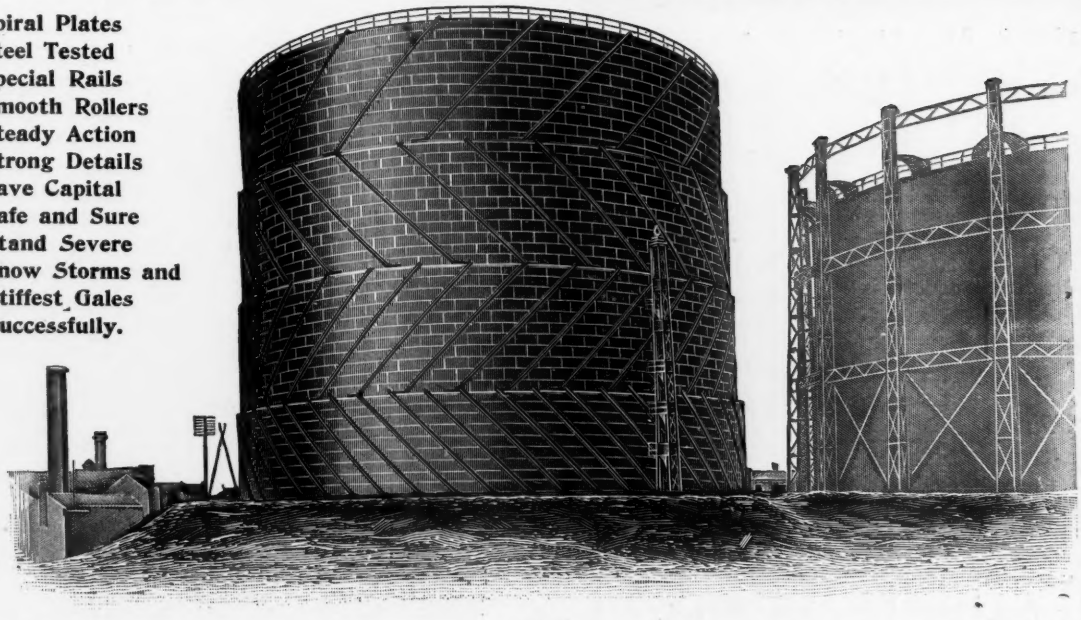

From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

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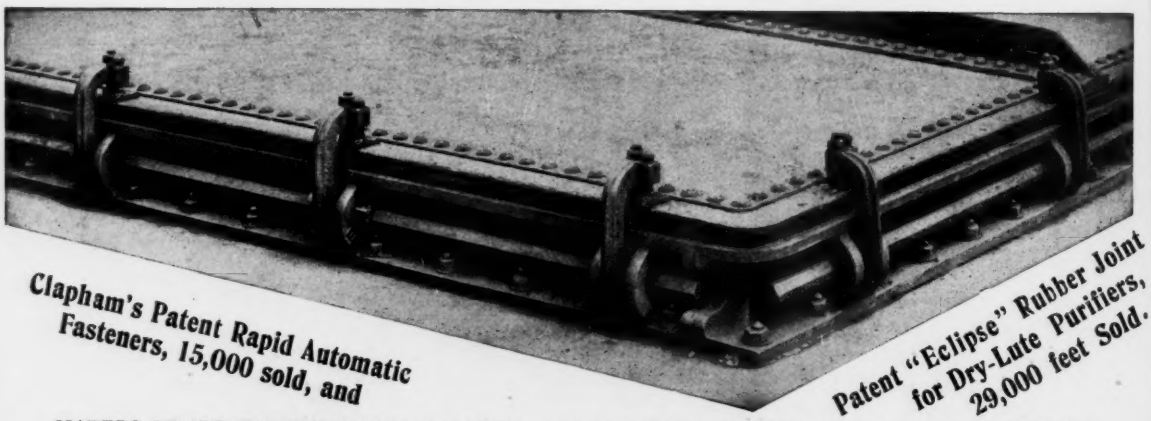

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